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(54) ELECTROLYTIC CAPACITOR DRIVE ELECTROLYTE AND ELECTROLYTIC CAPACITOR PROVIDED THEREWITH

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an electrolytic capacitor drive electrolyte solution which is low in impedance, excellent in low-temperature characteristics, and high in lifetime characteristics, and has an excellent hydrogen gas absorption effect even if a mixed solvent large in water content is used or an electrolytic capacitor is used in a high-temperature environment.
SOLUTION: An electrolyte solution contains solvent composed of 20 to 80 wt.% organic solvent and 80 to 20 wt.% water and at least one electrolyte selected out of carboxylic acid, carboxylate, inorganic acid, and its salt, and at least a nitro-compound selected out of nitrophenole, nitrobenzoate, dinitrobenzoate, nitro acetophenone, and nitro-anisole is added to the above electrolyte solution.

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[Claim(s)]
[Claim 1] The electrolytic solution for electrolytic capacitor actuation with which the electrolytic solution containing at least one sort of electrolytes chosen from the solvent which consists of 20 - 80% of the weight of an organic solvent and 80 - 20% of the weight of water, and the group which consists of a carboxylic acid or its salt and an inorganic acid, or its salt is characterized by including at least one sort of nitro compounds.
[Claim 2] The electrolytic solution for electrolytic capacitor actuation according to claim 1 characterized by being chosen from the group which said nitro compound becomes from a nitrophenol, a nitro benzoic acid, a dinitro benzoic acid, a nitro acetophenone, and a nitro anisole.
[Claim 3] The electrolytic solution for electrolytic capacitor actuation according to claim 1 or 2 characterized by said nitro compound being the combination of the nitro compound beyond two sorts or it.
[Claim 4] The electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-3 characterized by adding said nitro compound in 0.01 - 5% of the weight of the amount on the basis of the whole quantity of the electrolytic solution concerned.
[Claim 5] The electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-4 characterized by said organic solvent being a proton system solvent, a non-proton system solvent, or its mixture.
[Claim 6] The electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-5 characterized by being chosen from the group which said carboxylic acid or its salt becomes from formic acid, an acetic acid, a propionic acid, butanoic acid, p-nitrobenzoic acid, a salicylic acid, a benzoic acid, oxalic acid, a malonic acid, a succinic acid, a glutaric acid, an adipic acid, a fumaric acid, a maleic acid, a phthalic acid, an azelaic acid, a citric acid, oxy-butanoic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt.

[Claim 7] The electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-5 characterized by being chosen from the group which said inorganic acid or its salt becomes from a phosphoric acid, phosphorous acid, hypophosphorous acid, a boric acid, sulfamic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt.
[Claim 8] The following group :
(1) Chelate compound,
(2) Saccharide,
(3) hydroxybenzyl alcohol and (or) L-glutamic acid 2 acetic acid, or its salt — and
(4) a gluconic acid and (or) glucono lactone,
since — the electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-7 characterized by including further at least one sort of additives chosen.
[Claim 9] The electrolytic capacitor characterized by coming to contain the electrolytic solution for electrolytic capacitor actuation of a publication in any 1 term of claims 1-8.
[Procedure amendment 2]
[Document to be Amended] Description
[Item(s) to be Amended] 0011
[Method of Amendment] Modification
[Proposed Amendment]
[0011] Moreover, the electrolytic solution for electrolytic capacitor actuation which can do so the corrosion prevention effectiveness which was excellent to washing by halogenated hydrocarbon characterized by adding o-nitro anisole to the electrolytic solution which comes to dissolve various kinds of organic acids, an inorganic acid, or its salt as a solute in the solvent which makes ethylene glycol a subject is indicated by JP,63-14862,B. o-nitro anisole used for this official report as corrosion inhibitor here has the hydrogen gas absorption

effectiveness, the hydrogen gas generated from the interior while using an electrolytic capacitor is absorbed, and it is indicated that it is effective in the ability to control valve-open[redacted]cident and electrostatic-capacity change.

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] The electrolytic solution for electrolytic capacitor actuation characterized by adding at least one sort of nitro compounds chosen from the group which consists of a nitrophenol, a nitro benzoic acid, a dinitro benzoic acid, a nitro acetophenone, and a nitro anisole to the electrolytic solution containing at least one sort of electrolytes chosen from the solvent which consists of 20 - 80% of the weight of an organic solvent, and 80 - 20% of the weight of water, and the group which consists of a carboxylic acid or its salt and an inorganic acid, or its salt

[Claim 2] The electrolytic solution for electrolytic capacitor actuation according to claim 1 characterized by said nitro compound being the combination of the nitro compound beyond two sorts or it.

[Claim 3] The electrolytic solution for electrolytic capacitor actuation according to claim 1 or 2 characterized by adding said nitro compound in 0.01 - 5% of the weight of the amount on the basis of the whole quantity of the electrolytic solution concerned.

[Claim 4] The electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-3 characterized by said organic solvent being a proton system solvent, a non-proton system solvent, or its mixture.

[Claim 5] The electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-4 characterized by being chosen from the group which said carboxylic acid or its salt becomes from formic acid, an acetic acid, a propionic acid, butanoic acid, p-nitrobenzoic acid, a salicylic acid, a benzoic acid, oxalic acid, a malonic acid, a succinic acid, a glutaric acid, an adipic acid, a fumaric acid, a maleic acid, a phthalic acid, an azelaic acid, a citric acid, oxy-butanoic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt.

[Claim 6] The electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-4 characterized by being chosen from the group which said inorganic acid or its salt becomes from a phosphoric acid, phosphorous acid, hypophosphorous acid, a boric acid, sulfamic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt.

[Claim 7] the following group:(1) chelate compound, (2) saccharides, (3) hydroxybenzyl alcohol and (or) L-glutamic acid 2 acetic acid or its salt, (4) gluconic acids, and (or) glucono lactone — since — the electrolytic solution for electrolytic capacitor actuation given in any 1 term of claims 1-6 characterized by including further at least one sort of additives chosen.

[Claim 8] The electrolytic capacitor characterized by coming to contain the electrolytic solution for electrolytic capacitor actuation of a publication in any 1 term of claims 1-7.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to an electrolytic capacitor. When it states in more detail, this invention is low impedance, and it excels in a low-temperature property, and a life property is related with the electrolytic capacitor with which the good electrolytic solution for electrolytic capacitor actuation and good it were used, especially an aluminium electrolytic capacitor.
[0002]
[Description of the Prior Art] A capacitor is one of the common electrical parts, and is widely used mainly for the object for power circuits, and the noise filters of a digital circuit in various electrical and electric equipment and electronic products. A capacitor is divided roughly into an electrolytic capacitor and other capacitors (a ceramic condenser, film capacitor, etc.).
[0003] When there is a thing of various classes in the electrolytic capacitor by which the current activity is carried out and the example is shown, they are an aluminium electrolytic capacitor, a wet tantalum electrolytic capacitor, etc. In addition, what can expect the effectiveness excellent in especially this invention shall point out an aluminium electrolytic capacitor except for the case where there is a notice especially, when it is an aluminium electrolytic capacitor, this invention is hereafter explained with reference to this kind of electrolytic capacitor and it calls it an "electrolytic capacitor."
[0004] Typically, the conventional aluminium electrolytic capacitor can be manufactured by using the anode plate foil which anodized the front face of the aluminium foil and gave the coat, and the cathode foil etched in the front face, after etching high grade aluminium foil and making the surface area increase. Subsequently, the component of the structure which have arranged the anode plate foil and cathode foil which were obtained face to face, and the separator (isolation paper) was made to intervene in the medium of those foils further, and was wound, and nothing and this component are rolled, and the electrolytic solution is sunk into the component of ****** structure. The component after electrolytic-solution impregnation is held in a case (generally product made from aluminum), and it seals with an elastic obturation object, and an electrolytic capacitor is completed. In addition, there are also things other than such winding structure in an electrolytic capacitor.
[0005] In the above electrolytic capacitors, the big factor as which the property of the electrolytic solution determines the engine performance of an electrolytic capacitor is made. in connection with especially the miniaturization of an electrolytic capacitor in recent years, an anode plate foil or a cathode foil is dirty — SIG — since what has a high scale factor comes to be used and the resistivity of the body of a capacitor is large, as the electrolytic solution used for this, the thing of high conductivity which has small resistivity (specific resistance) is always required.
[0006] As for the electrolytic solution of an old electrolytic capacitor, what dissolved carboxylic acids, such as an adipic acid and a benzoic acid, or the ammonium salt of those in the solvent which added water to about 10 % of the weight, and constituted ethylene glycol (EG) in this as a main solvent as an electrolyte is common. In such the electrolytic solution, specific resistance is 1.5 ohm-m (150 ohm-cm) extent.
[0007] On the other hand, in order to fully demonstrate the engine performance in a capacitor, reducing an impedance (Z) is called for continuously. Various factors determine an impedance, for example, if the electrode surface product of a capacitor increases, it will fall, therefore if it becomes a large-sized capacitor, low impedance-ization will be attained naturally. Moreover, there is also approach which attains low impedance-ization by improving a separator. But in the small capacitor, the specific resistance of the electrolytic solution serves as a big rule factor of an impedance especially.
[0008] Recently, the electrolytic solution of the low specific resistance which used the organic solvent of a non-proton system, for example, GBL etc., (gamma-butyrolactone) is also developed (for example, please refer to JP,62-145713,A, JP,62-145714,A, and JP,62-145715,A). However, compared with the solid-state capacitor by which specific resistance used the electronic conductor of 1.0 or less ohm-cm, the impedance is far inferior in the capacitor using this non-proton system electrolytic solution.
[0009] Moreover, a ratio with an impedance [in -40 degrees C / in / in order to use the electrolytic solution, the low-temperature property of an aluminium electrolytic capacitor is bad, and / 100kHz], and an impedance of 20 degrees C: About 40 and the quite large thing of Z (-40 degrees C)/Z (20 degrees C) are the actual condition. In view of such the actual condition, it is low specific resistance in current and low impedance, and to offer the aluminium electrolytic capacitor which was moreover excellent in the low-temperature property is desired.
[0010] Furthermore, the water used as a part of the solvent in the electrolytic solution of an aluminium electrolytic capacitor is the activity matter chemically for the aluminum which constitutes an anode plate foil and a cathode foil, therefore has the problem of reacting with an anode plate foil and a cathode foil, generating hydrogen gas or reducing a property remarkably. In order to solve conventionally the problem of the hydrogen gas generated in the load test of an electrolytic capacitor etc., the attempt which absorbs the generated hydrogen gas is also made. For example, JP,59-15374,B is indicating the electrolytic solution for electrolytic capacitor actuation characterized by having added the ammonium salt of a carboxylic acid and a carboxylic acid to the solvent which added 5 - 20% of the weight of water to ethylene glycol, having prepared buffer solution, and adding and preparing further 0.05 - 3% of the weight of p-nitrophenol. If this electrolytic solution is used, generation of a boehmite reaction and generating of hydrogen gas can be controlled, and the electrolytic capacitor which made the low-temperature property, the life property, etc. improve can be offered.
[0011] Moreover, the electrolytic solution for electrolytic capacitor actuation which can do so the corrosion prevention effectiveness which was excellent to washing by halogenated hydrocarbon characterized by adding o-nitro anisole to the electrolytic solution which comes to dissolve various kinds of organic acids, an inorganic acid, or its salt as a solute in the solvent which makes ethylene glycol a subject is indicated by JP,63-14862,A. o-nitro anisole used for this official report as corrosion inhibitor here has the hydrogen gas absorption effectiveness, the hydrogen gas generated from the interior while using an electrolytic capacitor is absorbed, and it is indicated that it is effective in the ability to control valve-opening accident and electrostatic-capacity change.
[0012] However, according to research of this invention persons, they are p-nitrophenol and o-nitro anisole, The hydrogen gas-absorption effectiveness it may be satisfied with the electrolytic solution for electrolytic capacitor actuation with the low concentration of water which is generally used conventionally of the effectiveness although it is said that the early hydrogen gas absorption effectiveness could be done so when the amount of the water occupied to the solvent in the electrolytic solution became more than 20 % of the weight or it, or when an electrolytic capacitor is used over a long period of time under hot environments was shown, and it became clear that it was unmaintainable.
[0013]

[Problem(s) to be Solved by the Invention] This invention is a thing aiming at solving a trouble of a Prior art which was described above. The 1st object It excels in the low-temperature p[illegible]y which is low impedance and is expressed with t[illegible]edance ratio in low temperature and ordinary temperature. A life property is good [illegible]t is in offering the electrolytic solution for actuatio[illegible]electrolytic capacitors which can do so the hydrogen gas absorption effectiveness of having excelled even when an electrolytic capacitor was used under the time of using the electrolytic solution which moreover used the mixed solvent with the large content rate of water, or hot environments.
[0014] Another object of this invention is to offer the electrolytic capacitor which used the electrolytic solution of this invention, especially an aluminium electrolytic capacitor.
[0015]
[Means for Solving the Problem] The solvent with which this invention consists of 20 - 80% of the weight of an organic solvent, and 80 - 20% of the weight of water in the one field, As opposed to the electrolytic solution containing at least one sort of electrolytes chosen from the group which consists of a carboxylic acid or its salt and an inorganic acid, or its salt It is in the electrolytic solution for electrolytic capacitor actuation characterized by adding at least one sort of nitro compounds chosen from the group which consists of a nitrophenol, a nitro benzoic acid, a dinitro benzoic acid, a nitro acetophenone, and a nitro anisole.
[0016] It is still more desirable to use said nitro compound with combination with the component of the other electrolytic solutions, in the electrolytic solution of this invention, combining two sorts or the nitro compound beyond it, in order to be able to do so the hydrogen gas absorption effectiveness of having excelled even if it used it independently and to acquire more remarkable effectiveness. When adding and using it for the electrolytic solution of this invention, as for a nitro compound, it is desirable to add and use it in 0.01 - 5% of the weight of an amount on the basis of the whole quantity of the electrolytic solution.
[0017] The organic solvent used together with water for formation of a mixed solvent is a proton system solvent, a non-proton system solvent, or its mixture preferably. That is, a proton system solvent and a non-proton system solvent may be used independently, otherwise may be used for arbitration combining two sorts or more than it if needed, respectively. Here, a proton system solvent is an alcoholic compound preferably, and a non-proton system solvent is a lactone compound preferably.
[0018] Furthermore, the carboxylic acid used as an electrolyte in the electrolytic solution of this invention or its salt is one sort preferably chosen from the group which consists of formic acid, an acetic acid, a propionic acid, butanoic acid, p-nitrobenzoic acid, a salicylic acid, a benzoic acid, oxalic acid, a malonic acid, a succinic acid, a glutaric acid, an adipic acid, a fumaric acid, a maleic acid, a phthalic acid, an azelaic acid, a citric acid, oxy-butanoic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt, or more than it.
[0019] Moreover, the inorganic acid similarly used as an electrolyte or its salt is one sort chosen from a phosphoric acid, phosphorous acid, hypophosphorous acid, a boric acid, sulfamic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt, or more than it preferably. moreover — the electrolyte of this invention — said nitro compound — adding — the following group:(1) chelate compound, (2) saccharides, (3) hydroxybenzyl alcohol and (or) L-glutamic acid 2 acetic acid or its salt, (4) gluconic acids, and (or) glucono lactone — since — the additive chosen may be included if needed. These additives may be used independently or may be used for arbitration combining two sorts or the additive beyond it.
[0020] This invention is in the electrolytic capacitor which comes to contain the electrolytic solution for actuation of this invention for electrolytic capacitors in the field of another further again.
[0021]
[Embodiment of the Invention] In the electrolytic solution for electrolytic capacitor actuation of this invention, it considers as the solvent for dissolving an electrolyte, it carries out, and a solvent with the high moisture concentration which consists of mixture of an organic solvent and water is used. As an organic solvent, as described above, it is independent, or a proton system solvent or a non-proton system solvent can be combined and used for arbitration. An alcoholic compound can be mentioned as an example of a suitable proton system solvent. Moreover, although not necessarily limited to what is enumerated below as a concrete example of the alcoholic compound which can be used advantageously here, trihydric alcohol, such as dihydric alcohol (glycol), such as monohydric alcohol, such as ethyl alcohol, propyl alcohol, and butyl alcohol, ethylene glycol, a diethylene glycol, triethylene glycol, and propylene glycol, and a glycerol, can be mentioned. Moreover, a lactone compound can be mentioned as an example of a suitable non-proton system solvent. Moreover, although not necessarily limited to what is enumerated below as a concrete example of the lactone compound which can be used advantageously here, the intramolecular polarization compound of gamma-butyrolactone or others can be mentioned. In using one or more sorts chosen from a proton system solvent and a non-proton system solvent in operation of this invention If it explains more concretely, one sort of proton system solvents may be used. One sort of non-proton system solvents may be used, two or more sorts of proton system solvents may be used, and two or more sorts of non-proton system solvents may be used, or the mixed stock of one or more sorts of proton system solvents and one or more sorts of non-proton system solvents may be used.
[0022] In the electrolytic solution of this invention, the water other than the above-mentioned organic solvent is used as a solvent component, and, especially in the case of this invention, it is distinguished from the electrolytic solution conventional at the point of using together a lot of water in comparison. In this invention, by using such a solvent, the congealing point of a solvent can be reduced, the specific resistance property of the electrolytic solution in low temperature can be improved by that cause, and the good low-temperature property by which the difference of the specific resistance in low temperature and ordinary temperature is shown according to a small thing can be realized. It is suitable for the content of the water in the electrolytic solution that it is in 20 - 80% of the weight of the range, and the remainder is an organic solvent. Also when there are few contents of water than 20 % of the weight and it exceeds 80 % of the weight, it becomes inadequate [the degree of the freezing point depression of the electrolytic solution], and it becomes difficult to acquire the good low-temperature property of an electrolytic capacitor. The content of suitable water is 30 - 80% of the weight of the range, and the content of the most suitable water is 45 - 80% of the weight of the range rather than it can set in an aquosity mixed solvent.
[0023] as the electrolyte in the electrolytic solution of this invention — an organic acid — especially, a carboxylic acid or its salt and an inorganic acid, or its salt may be used preferably, and these electrolyte components may be used independently, or you may use it combining two or more sorts. also although kicked, the carboxylic acid which the dicarboxylic acid represented by the monocarboxylic acid which is not necessarily limited to what is enumerated below as an example of a carboxylic acid usable as an electrolyte component, and which is represented by formic acid, an acetic acid, a propionic acid, butanoic acid, p-nitrobenzoic acid, a salicylic acid, and the benzoic acid, oxalic acid and a malonic acid, a succinic acid, a glutaric acid, an adipic acid, a fumaric acid, a maleic acid, a phthalic acid, and the azelaic acid was contained, for example, had functional groups, such as hydroxyl, like a citric acid and oxy-butanoic acid is also usable
[0024] Moreover, although not necessarily limited to what is enumerated below as an example of the same inorganic acid usable as an electrolyte component, a phosphoric acid, phosphorous acid, hypophosphorous acid, a boric acid, sulfamic acid, etc. are contained. Furthermore, although various salts can be used as a salt of a carboxylic acid which was described above, or an inorganic acid, as a suitable salt, ammonium salt, sodium salt, potassium salt, an amine salt, alkyl ammonium salt, etc. are contained, for example. Also in such a salt, it is more desirable to use ammonium salt.
[0025] Furthermore, in addition, if an inorganic acid or its salt is used as an electrolyte in operation of this invention, the depression of freezing point of the electrolytic solution can be expected, therefore it can contribute to the further improvement in the low-temperature property of the electrolytic solution. Moreover, especially the activity of an inorganic acid or its salt deserves attention also in that the hydrogen gas absorption capacity (it explains in full detail below) originating in the nitro compound used in this invention is maintainable over a long period of

time.
[0026] Moreover, if it is used for the carboxy[illegible]d which described above an electrolyte like such [illegible]ganic acid or its salt according to research of this invention persons, or an elec[illegible]e like the salt, combining, as compared with the ca[illegible]here they are used independently, the effectiveness that the life of an electrolytic capacitor is notably extensible can also be acquired. Furthermore, in the conventional electrolytic capacitor, from problems, such as electric conductivity, although mainly used for the electrolytic capacitor of the type of inside – high tension (160–500 volts), the electrolyte of an inorganic–acid system can be advantageously used also in the electrolytic capacitor of the type of a low battery (less than 160 volts), when an electrolytic combination activity is performed like this invention.
[0027] The amount of the electrolyte used in the electrolytic solution of this invention can determine the optimal amount suitably according to various kinds of factors, such as a class of the class of the property required of the electrolytic solution or the capacitor obtained eventually, and solvent to be used, a presentation and an amount, and electrolyte to be used. For example, as described above, when a carboxylic–acid system uses it combining the electrolyte of an inorganic–acid system, although it is said in the large range that the content of the electrolyte of the inorganic–acid system in a mixed electrolyte can be changed, it is usually desirable [a content] that the electrolyte of an inorganic–acid system is contained on the basis of the electrolytic whole quantity in about 0.1 – 15% of the weight of the range.
[0028] The aquosity mixed solvent with which especially the electrolytic solution of this invention consists of the electrolytic solution of a specific presentation which was described above, i.e., 20 – 80% of the weight of an organic solvent and 80 – 20% of the weight of water. As opposed to the electrolytic solution containing at least one sort of electrolytes chosen from the group which consists of a carboxylic acid or its salt and an inorganic acid, or its salt A nitrophenol, for example, p–nitrophenol, a nitro benzoic acid, For example, it is characterized by adding as an additive of addition of at least one sort of nitro compounds chosen from compound groups, such as p–nitrobenzoic acid, a dinitro benzoic acid, a nitro acetophenone, for example, p–nitro acetophenone, and a nitro anisole.
[0029] Although the remarkable hydrogen gas absorption effectiveness was especially checked in this invention when the above–mentioned nitro compound group was used, the exact circumstances have still come to become clear. However, this is understood to be what has a big factor in doing the hydrogen gas absorption effectiveness so to the timing from which the substituent contained in each nitro compound differs from an experience of this invention persons. In addition, the nitro compound used here can double and have the operation (if it puts in another way halogen prehension operation) which controls that a component is made to corrode by operation of the halogenated hydrocarbon used on the occasion of washing of a printed circuit board, for example, trichloroethane etc.
[0030] Also although the above–mentioned nitro compound can do so the hydrogen gas absorption effectiveness, a halogen prehension operation, etc. which may be satisfied even if it uses it independently since the specific presentation effective in the effectiveness of this invention is adopted as the electrolytic solution itself when adding it to the electrolytic solution of this invention According to the knowledge of this invention persons' this time, effectiveness with still more desirable using it combining two sorts or the nitro compound beyond it is expectable. Generally, mixing and using two sorts of nitro compounds is recommended. Moreover, as for a nitro compound, it is usually desirable to add and use it in 0.01 – 5% of the weight of an amount on the basis of the whole quantity of the electrolytic solution. If the addition of a nitro compound is less than 0.01 % of the weight, even if it can hardly acquire expected effectiveness but exceeds 5 % of the weight reversely, the further improvement in expected effectiveness cannot be expected, but an adverse effect will be made to other properties depending on the case, and things will also be considered.
[0031] having used the nitro compound independently, as the Prior art, by the way, referred to absorption of aluminum and the hydrogen gas generated in the reaction time of water, when the activity of a nitro compound was explained further — if — it is in the inclination which the content of the water in the solvent to be used increases for it to be alike, to take and for an absorption effect to fall, and this lowering inclination becomes remarkable when the electrolytic solution sets under hot environments. However, the problem which originates in the independent activity of such a nitro compound, and is generated is solvable by [as / in this invention] using it combining two sorts or the nitro compound beyond it. In the case of the electrolytic solution of this invention, hydrogen gas absorption capacity was farther [than the conventional independent activity] actually maintainable over the long period of time with the activity of two or more sorts of nitro compounds under elevated–temperature neglect.
[0032] Moreover, the effectiveness which was excellent in this invention in absorption of hydrogen gas was able to be checked also in relation with the electrolyte used together. In the conventional electrolytic solution, the technique added only to the electrolyte of an inorganic–acid system, respectively has been adopted [nitro compound / the electrolyte of a carboxylic–acid system, or one kind of] only in one kind of nitro compound. However, although the same was said of the electrolytic solution with which the hydrogen gas absorption effectiveness may be satisfied with the above technique of the effectiveness cannot be acquired, and the electrolyte of a carboxylic–acid system and the electrolyte of an inorganic–acid system are intermingled when there were many contents of the water in a solvent In the case of the electrolytic solution of this invention (only one kind of nitro compound is used), also in such a carboxylic–acid system / the inorganic–acid system mixture electrolytic solution, hydrogen gas absorption capacity was farther [than the conventional independent activity] maintainable over the long period of time to the surprising thing.
[0033] The electrolytic solution of this invention can be contained as an additive of addition of the component except having described above if needed. The following compounds are included so that this invention persons may invent on this invention and a simultaneous target and it may be indicated as a suitable additive by invention which carried out patent application independently, for example.
(1) A chelate compound (EDTA), for example, ethylenediaminetetraacetic acid, a transformer –1 and 2–diamino cyclohexane – N, N, N', and N' – 4 acetic–acid monohydrate (CyDTA) — A dihydroxyethyl glycine (DHEG), ethylenediamine tetrakis (methylene phosphonic acid) (EDTPO), Diethylenetriamine – N, N, N', N"N" –5 acetic acid (DTPA), A diamino propanol tetraacetic acid (DPTA–OH), ethylenediamine 2 acetic acid (EDDA), Ethylenediamine–N and N'–screw (methylene phosphonic acid) 1 / 2 hydrate (EDDPO), a glycol ether diamine tetraacetic acid (GEDTA), hydroxyethyl ethylenediamine triacetic acid (EDTA–OH), etc. As for a chelate compound, generally, it is desirable to add in 0.01 – 3% of the weight of the range. Such a chelate compound can bring about effectiveness, such as an improvement (since a solvent is the presentation near non–******, change of the impedance in ordinary temperature and low temperature becomes small) of the reinforcement of the capacitor by control of the hydration reaction of (Aluminum aluminum) electrode foil of a low impedance capacitor, and the low–temperature property of an electrolytic capacitor, and corrosion–resistant improvement.
[0034] (2) A saccharide, for example, a glucose, a fructose, a xylose, a galactose, etc. As for a saccharide, generally, it is desirable to add in 0.01 – 5% of the weight of the range. Such a saccharide can bring about effectiveness, such as an improvement (since a solvent is the presentation near non–******, change of the impedance in ordinary temperature and low temperature becomes small) of disassembly of the electrolyte by the reinforcement of the capacitor by control of the hydration reaction of aluminum electrode foil of a low impedance capacitor, and addition of a saccharide, for example, a carboxylic acid, control of activation, and the low–temperature property of an electrolytic capacitor.
[0035] (3) Hydroxybenzyl alcohol, for example, 2–hydroxybenzyl alcohol, L–glutamic acid 2 acetic acid, or its salt. As for this additive, generally, it is desirable to add in 0.01 – 5% of the weight of the range. Such an additive can bring about effectiveness, such as an improvement (since a solvent is the presentation near non–******, change of the impedance in ordinary temperature and low temperature becomes small) of the reinforcement of the capacitor by control of the hydration reaction of aluminum electrode foil of a low impedance capacitor, and the low–temperature property of an electrolytic capacitor.
[0036] The above–mentioned compound (1) – (3) can do much remarkable effectiveness so, respectively, when adding them to the electrolytic solution of this invention, and even when the nitro compound is not contained in the electrolytic solution, it can expect much of the

effectiveness. Moreover, according to research of this invention persons, such remarkable effectiveness especially can be acquired when it combines with one gluconic acids following a[redacted] one sort and glucono lactone of above-mentione[redacted]pound (1) - (3).
[0037] furthermore, the electrolytic solution o[redacted]s invention is added to an additive (also in indepen[redacted]addition of a nitro compound, it contains) which was described above, and is independent in (4) gluconic acids, glucono lactone, etc. if needed — or it can combine and contain. As for this kind of additive, generally, it is desirable to add in 0.01 - 5% of the weight of the range. When it is added and included in the electrolytic solution of this invention, a gluconic acid and glucono lactone can be added to effectiveness peculiar to this invention called the reinforcement of an electrolytic capacitor, the improvement in a low-temperature property, the outstanding hydrogen gas absorption effectiveness, etc., and can bring about the remarkable effectiveness of corrosion-resistant improvement further.
[0038] An additive in ordinary use may be further added also to everything but the above-mentioned additive further again in the field of an aluminium electrolytic capacitor or other electrolytic capacitors. As an additive of suitable daily use, mannite, a silane coupling agent, water-soluble silicone, a polyelectrolyte, etc. can be mentioned, for example. the electrolytic solution of this invention can mix various kinds of components which were described above in order of arbitration, and can prepare them by dissolving, and there is as it is about the conventional technique fundamentally — it is — it can be used, being able to change. For example, after preparing a solvent with the high moisture concentration which is the mixture of an organic solvent and water, it can prepare easily by dissolving the additive of arbitration in the obtained solvent an electrolyte, a nitro compound, and if needed.
[0039] The electrolytic capacitor of this invention as well as the above-mentioned electrolytic solution can be manufactured according to a technique in ordinary use. For example, the anode plate foil manufactured from the aluminum which oxidized and dielectric-ized the front face. The cathode foil which has the etching front face made from aluminum which counters the field which this anode plate foil dielectric-ized, After sinking the electrolytic solution of this invention into the component of the wound structure which was constituted from a separator (isolation paper) by which it is placed between the questions of an anode plate foil and a cathode foil, an aluminium electrolytic capacitor can be manufactured by sealing the component in a suitable case. In the aluminium electrolytic capacitor obtained, since the electrolytic solution of this invention is used, the effectiveness of the improvement in a low-temperature property by the mixed solvent of an organic solvent and water, the hydrogen gas absorption effectiveness by addition of a nitro compound, and the effectiveness of the reinforcement and low-impedance-izing by hydration reaction control by the activity of a specific electrolyte can be attained.
[0040]
[Example] Next, an example explains this invention further. Needless to say, the example hung up here is for illustrating this invention, and does not tend to limit this invention.
The aluminium electrolytic capacitor of example 1 winding structure was manufactured according to the following procedure.
[0041] First, etching processing of the aluminium foil was carried out electrochemically, the oxide film was formed in the front face, the lead tab for electrode cash drawers was attached after that, and the aluminum anode plate foil was made. Next, after performing etching processing to an electrochemistry target too at another aluminium foil, the **** attachment ** aluminum cathode foil was made for the lead tab for electrode cash drawers. Then, the capacitor element was made by winding on both sides of a separator (isolation paper) between an anode plate foil and a cathode foil. And after sinking into this capacitor element the electrolytic solution which showed the presentation in the 1st following table, as the lead tab for electrode cash drawers came out of the case, it held in the closed-end aluminum case, and to it, opening of this case was sealed with the elastic obturation object, and the electrolytic capacitor (10WV-1000micro F) of winding structure was produced to it.
[0042] When the specific resistance in 30 degrees C of the electrolytic solution used by this example was measured, measured value like the publication to the 1st following table was obtained. Moreover, a frequency which is different about the produced electrolytic capacitor in the impedance ratio (Z ratio) expressed as a ratio with that of each measured value after measuring the impedance in low temperature (-40 degrees C), and the impedance in ordinary temperature (20 degrees C): It measured by 120Hz and 100kHz. Measured value like the publication to the 1st following table was obtained. Furthermore, in order to evaluate the life property of each electrolytic capacitor, initial value (weighted solidity immediately after production of a capacitor) and weighted solidity after elevated-temperature neglect (1000 hours pass at 105 degrees C) were measured about each of capacity, tandelta, and the leakage current. Measured value like the publication to the 1st following table was obtained.
examples 2-10 — although the technique of a publication was repeated in said example 1, in this example, the presentation of the electrolytic solution to be used was changed into the 1st following table like a publication. The result obtained by the characteristic test is collectively indicated to the 1st following table.
the examples 1-4 of a comparison — although the technique of a publication was repeated in said example 1, while removing the nitro compound from the electrolytic solution to be used for the comparison in this example, the presentation of the electrolytic solution was changed into the 1st following table like a publication. The result obtained by the characteristic test is collectively indicated to the 1st following table.
[0043]
[A table 1]

[0044]
[A table 2]

表1続

例の番号	電解液の組成（重量%）		比抵抗30℃（Ω・cm）	Z比		初期値			105℃ 3000時間後		
				120Hz [-40／20℃]	100kHz [-40／20℃]	容量（μF）	tanδ（%）	漏れ電流（μA）	容量（μF）	tanδ（%）	漏れ電流（μA）
実施例1	エチレングリコール	25.0	28	1.1	4.6	1044	5.4	7.7	898	6.2	2.3
	水	68.0									
	ギ酸アンモニウム	4.6									
	次亜リン酸	0.4									
	n－ニトロアセトフェノン	1.0									
	ニトロ安息香酸	1.0									
実施例2	エチレングリコール	20.0	26	1.1	4.4	1034	5.4	7.2	900	6.2	2.3
	水	59.0									
	グルタル酸アンモニウム	16.4									
	スルファミン酸	1.6									
	ニトロフェノール	1.0									
	n－ニトロアセトフェノン	1.0									
実施例3	エチレングリコール	15.0	23	1.1	3.9	1025	5.3	7.0	902	6.1	2.0
	水	60.0									
	アジピン酸アンモニウム	23.0									
	ニトロ安息香酸	1.0									
	ニトロフェノール	1.0									
実施例4	エチレングリコール	22.0	21	1.1	3.8	1020	5.2	6.8	918	6.0	[redacted]
	水	50.0									
	コハク酸アンモニウム	25.0									
	ベンゼンスルホン酸	0.4									
	ニトロフェノール	2.6									
実施例5	エチレングリコール	48.0	161	1.2	5.6	1024	8.7	6.2	932	9.5	1.9
	水	40.0									
	ホウ酸アンモニウム	11.0									
	ニトロ安息香酸	1.0									
実施例6	エチレングリコール	54.0	29	1.0	3.7	1010	5.4	6.1	929	6.2	2.0
	水	30.0									
	スルファミン酸アンモニウム	14.6									
	リン酸	0.4									
	n－ニトロアセトフェノン	1.0									
実施例7	エチレングリコール	60.0	58	1.0	3.6	1003	6.2	6.3	933	7.0	2.1
	水	20.0									
	アジピン酸アンモニウム	18.6									
	ホウ酸	0.4									
	ニトロ安息香酸	1.0									
実施例8	エチレングリコール	62.0	94	1.0	3.8	1005	7.1	6.2	940	7.9	2.1
	水	27.0									
	アジピン酸アンモニウム	9.0									
	n－ニトロアセトフェノン	1.0									
	ニトロフェノール	1.0									
実施例9	エチレングリコール	40.0	40	1.0	3.6	1018	5.8	6.4	937	6.4	2.2
	水	40.0									
	グルタル酸アンモニウム	19.0									
	ニトロ安息香酸	1.0									
実施例10	エチレングリコール	50.0	88	1.0	3.7	1013	6.4	6.4	942	7.0	2.3
	水	39.4									
	アジピン酸アンモニウム	9.2									
	スルファミン酸	0.4									
	ニトロフェノール	1.0									

2.0

表1 表(続き)

例の番号	電解液の組成（重量%）		比抵抗30℃ (Ω・cm)	Z比		初期値			105℃ 3000時間後			
				[-40℃/20℃]	[-40℃/20℃]	容量 (μF)	tanδ (%)	漏れ電流 (μA)	容量 (μF)	tanδ (%)	漏れ電流 (μA)	外観
比較例1	エチレングリコール 水 アジピン酸アンモニウム	60.0 30.0 10.0	85	1.3	36.1	1000	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 水 アジピン酸アンモニウム	45.0 40.0 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 水 アジピン酸アンモニウム	30.0 50.0 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
比較例4	エチレングリコール 水 アゾジピン酸アンモニウム ニトロ安息香酸	29.0 50.0 20.0 1.0	20	1.0	7.9	1022	4.8	7.0	ガス発生により1000時間までに全数防爆弁作動			

[0045] Except for an example 5, it turns out that the specific resistance of the electrolytic solution of this invention is almost equivalent to the thing of the example of a comparison, and it turns out that such resistivity is small compared with it of the conventional common electrolytic solution so that I may be understood from a result given in the 1st above-mentioned table. It can be said that it is substantially [as the usual electrolytic capacitor] equal, and is in sufficiently practical level when it judges synthetically in consideration of other properties although the specific resistance of the electrolytic solution of an example 5 is the big value of 161 ohm-cm. Therefore, the electrolytic capacitor produced using the electrolytic solution of this invention can realize much more low impedance compared with the conventional electrolytic capacitor, and even if it is not so, it can realize an old thing and low impedance of equivalent extent at least.

[0046] Moreover, if it is in the electrolytic capacitor which used the electrolytic solution of this invention, it turns out that Z ratio is small, and it turns out that Z ratio in the high frequency which is especially 100kHz is small stopped

compared with the thing of the example of a comparison. This shows that the electrolytic capacitor which used the electrolytic solution of this invention demonstrates a low-temperature property with a good rear spring supporter in a large frequency. Especially in the electrolytic capacitor which used the electrolytic solution of this invention, by having added the nitro compound to the electrolytic solution in the amount of 0.01 - 3% of the weight of the range, the property stabilized after 3000-hour progress at 105 degrees C is shown, and it did not result in destruction of the capacitor by the generation of gas itself. To it, in the phase in early stages of the elevated-temperature neglect before [far] 3000 hours pass, the explosion-proof valve operated with the swelling of the case by the hydrogen generation of gas, and it became use impossible by any capacitor with the electrolytic capacitor of the example of a comparison which used the electrolytic solution which does not contain a nitro compound. According to this invention, this shows that the reinforcement of an electrolytic capacitor can attain easily.

examples 11-19 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of a chelate compound and a nitro compound in this example, the presentation of the electrolytic solution to be used was changed into the 2nd following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 2nd following table. In addition, in the 2nd following table, the test result of said examples 1-3 of a comparison is also united and indicated.

[0047]

[Table 3]

第２表

例の番号	電解液の組成（重量％）		比抵抗30℃ [Ω・cm]	Z比		初期値			105℃ 1000時間後			
				120Hz [-40／20℃]	100kHz [-40／20℃]	容量 [μF]	tanδ [%]	漏れ電流 [μA]	容量 [μF]	tanδ [%]	漏れ電流 [μA]	外観
比較例１	エチレングリコール 水 アジピン酸アンモニウム	60.0 30.0 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例２	エチレングリコール 水 アジピン酸アンモニウム	45.0 40.0 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例３	エチレングリコール 水 アジピン酸アンモニウム	30.0 50.0 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
実施例11	エチレングリコール 水 ギ酸アンモニウム 次亜リン酸 p－ニトロ安息香酸 エチレンジアミン四酢酸	25.0 69.4 4.0 0.4 0.8 0.4	21	1.1	4.6	1044	5.2	7.8	919	5.8	2.5	
実施例12	エチレングリコール 水 グルタル酸アンモニウム スルファミン酸 ニトロフェノール エチレンジアミン四酢酸	20.0 59.2 17.8 1.6 1.0 0.4	26	1.1	4.4	1036	5.4	7.3	922	6.0	2.3	
実施例13	エチレングリコール 水 アジピン酸アンモニウム ジニトロ安息香酸 エチレンジアミン二酢酸	15.0 58.7 24.4 1.5 0.4	23	1.1	3.9	1028	5.3	7.1	925	5.9	2.2	
実施例14	エチレングリコール 水 コハク酸アンモニウム ベンゼンスルホン酸 p－ニトロ安息香酸 ジエチレントリアミン五酢酸	24.2 50.0 24.2 0.4 0.8 0.4	21	1.1	3.8	1021	5.2	6.9	930	5.8	2.2	

[0048]
[Table 4]

表2表（続き）

例の番号	電解液の組成〔重量%〕		比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 1000時間後			外観
				120Hz/20℃ [-40/20℃]	100kHz/20℃ [-40/20℃]	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	
実施例15	エチレングリコール	55.0	29	1.0	3.7	1009	5.4	6.2	938	6.0	2.2	
	水	28.0										
	スルファミン酸アンモニウム	14.0										
	リン酸	2.0										
	ニトロフェノール	0.6										
	エチレンジアミン四酢酸	0.4										
実施例16	エチレングリコール	59.2	57	1.0	3.6	1002	6.1	6.4	944	6.7	2.4	
	水	20.0										
	アジピン酸アンモニウム	19.0										
	ホウ酸	0.4										
	ニトロアセトフェノン	1.0										
	エチレンジアミン二酢酸	0.4										
実施例17	エチレングリコール	62.0	92	1.0	3.8	1003	7.0	6.5	942	7.6	2.4	
	水	27.0										
	アジピン酸アンモニウム	9.3										
	EDTPO	0.1										
	ニトロ安息香酸	1.2										
	エチレンジアミン四酢酸	0.4										
実施例18	エチレングリコール	38.8	39	1.0	3.6	1018	5.8	6.3	937	6.4	2.1	
	水	40.0										
	グルタル酸アンモニウム	19.6										
	ニトロフェノール	1.2										
	EDTPO	0.4										
実施例19	エチレングリコール	48.8	68	1.0	3.7	1014	6.4	6.2	943	7.0	2.2	
	水	40.0										
	アジピン酸アンモニウム	9.2										
	スルファミン酸	0.4										
	ニトロフェノール	1.2										
	エチレンジアミン二酢酸	0.4										

[0049] examples 20-29 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of a saccharide and a nitro compound in this example, the presentation of the electrolytic solution to be used was changed into the 3rd following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 3rd following table. In addition, in the 3rd following table, the test result of said examples 1-3 of a comparison is also united and indicated.

[0050]

[Table 5]

[0051]
[Table 6]

第3表

例の番号	電解液の組成〔重量%〕		比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 1000時間後			
				120Hz〔-40／20℃〕	100kHz〔-40／20℃〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	外観
比較例1	エチレングリコール 水 アジピン酸アンモニウム	60.0 30.0 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 水 アジピン酸アンモニウム	45.0 40.0 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 水 アジピン酸アンモニウム	30.0 50.0 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
実施例20	エチレングリコール 水 ギ酸アンモニウム ガラクトース ニトロフェノール 次亜リン酸	23.2 70.0 4.4 1.0 1.0 0.4	22	1.1	4.6	1043	5.3	7.7	918	5.9	2.5	
実施例21	エチレングリコール 水 グルタル酸アンモニウム フルクトース ニトロ安息香酸 スルファミン酸	19.4 60.0 17.8 1.0 0.8 1.0	27	1.1	4.4	1035	5.4	7.2	921	6.0	2.3	
実施例22	エチレングリコール 水 アジピン酸アンモニウム ジニトロ安息香酸 キシロース	14.2 60.0 23.8 1.0 1.0	24	1.1	3.9	1027	5.3	7.0	924	5.9	2.2	
実施例23	エチレングリコール 水 コハク酸アンモニウム グルコース ニトロフェノール ベンゼンスルホン酸	20.8 50.0 24.8 1.0 3.0 0.4	22	1.1	3.8	1020	5.3	6.8	930	5.9	2.2	
実施例24	エチレングリコール 水 ホウ酸アンモニウム ニトロフェノール キシロース	48.7 39.8 9.0 1.5 1.0	162	1.2	5.6	1014	8.8	6.2	933	9.4	2.1	

第3表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃ (Ω・cm)	Z比 120Hz [-40/20℃]	Z比 100kHz [-40/20℃]	初期値 容量 (μF)	初期値 tanδ (%)	初期値 漏れ電流 (μA)	105℃ 1000時間後 容量 (μF)	105℃ 1000時間後 tanδ (%)	105℃ 1000時間後 漏れ電流 (μA)	105℃ 1000時間後 外観
実施例25	エチレングリコール 水 スルファミン酸アンモニウム フルクトース ニトロ安息香酸 リン酸	53.2 30.0 13.8 1.0 1.5 0.5	30	1.0	3.7	1008	5.5	6.1	937	6.1	2.2	
実施例26	エチレングリコール 水 アジピン酸アンモニウム グルコース ジニトロ安息香酸 ホウ酸	59.2 20.0 17.8 1.0 1.0 1.0	59	1.0	3.6	1001	6.2	6.3	944	6.8	2.4	
実施例27	エチレングリコール 水 アジピン酸アンモニウム ニトロ安息香酸 フルクトース	60.9 28.0 9.3 0.8 1.0	91	1.0	3.8	1002	7.0	6.2	944	7.6	2.4	
実施例28	エチレングリコール 水 グルタル酸アンモニウム ニトロアセトフェノン ガラクトース	38.2 40.0 18.8 2.0 1.0	40	1.0	3.6	1018	5.8	6.3	937	6.4	2.1	
実施例29	エチレングリコール 水 アジピン酸アンモニウム スルファミン酸 ニトロ安息香酸 キシロース	47.7 39.4 9.0 0.4 2.5 1.0	69	1.0	3.7	1013	6.4	6.2	942	7.0	2.2	

[0052] examples 30-39 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of hydroxybenzyl alcohol, glutamic-acid 2 acetic acid, etc. and a nitro compound in this example, the presentation of the electrolytic solution to be used was changed into the 4th following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 4th following table. In addition, in the 4th following table, the test result of said examples 1-3 of a comparison is also united and indicated.
[0053]
[Table 7]

[0054]
[Table 8]

第４表

例の番号	電解液の組成〔重量%〕	比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 1000時間後			
			120Hz〔-40／20℃〕	100kHz〔-40／20℃〕	容量〔μF〕	tanδ(%)	漏れ電流〔μA〕	容量〔μF〕	tanδ(%)	漏れ電流〔μA〕	外観
比較例1	エチレングリコール 60.0 水 30.0 アジピン酸アンモニウム 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 45.0 水 40.0 アジピン酸アンモニウム 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 30.0 水 50.0 アジピン酸アンモニウム 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
実施例30	エチレングリコール 24.0 水 68.0 ギ酸アンモニウム 4.4 次亜リン酸 0.4 ジニトロ安息香酸 1.2 ヒドロキシベンジルアルコール 2.0	21	1.1	4.6	1044	5.2	7.7	919	5.8	2.5	
実施例31	エチレングリコール 17.7 水 60.0 グルタル酸アンモニウム 16.8 スルファミン酸 1.6 ニトロフェノール 2.5 グルタミン酸二酢酸 1.4	27	1.1	4.4	1034	5.4	7.2	920	6.0	2.3	
実施例32	エチレングリコール 14.2 水 60.0 アジピン酸アンモニウム 23.4 ニトロ安息香酸 1.0 グルタミン酸二酢酸 1.4	24	1.1	3.9	1025	5.3	7.0	923	5.9	2.2	
実施例33	エチレングリコール 20.8 水 50.0 コハク酸アンモニウム 24.8 ベンゼンスルホン酸 0.4 ベニトロ安息香酸 2.0 ヒドロキシベンジルアルコール 2.0	22	1.1	3.8	1020	5.3	6.8	930	5.9	2.2	
実施例34	エチレングリコール 44.7 水 40.0 ホウ酸アンモニウム 9.8 ジニトロ安息香酸 1.5 ヒドロキシベンジルアルコール 4.0	161	1.2	5.6	1024	8.7	6.2	942	9.3	2.1	

表4表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃（Ω・cm）	Z比		初期値				105℃ 1000時間後			
				120Hz [-40/20℃]	100kHz [-40/20℃]	容量（μF）	tanδ（%）	漏れ電流（μA）	容量（μF）	tanδ（%）	漏れ電流（μA）	外観
実施例35	エチレングリコール	52.2	30	1.0	3.7	1010	5.5	6.1	939	6.1	2.2	
	ホスホノブタン-1,2,4-トリカルボン酸	30.0										
	ニトロフェノール	13.8										
	ヒドロキシベンジルアルコール	0.4										
	グルタミン酸二酢酸	1.0										
		2.6										
実施例36	エチレングリコール	57.2	63	1.0	3.6	1003	6.3	6.3	944	6.9	2.4	
	ホスホノブタン-1,2,4-トリカルボン酸	20.0										
	ニトロフェノール	15.0										
	ヒドロキシベンジルアルコール	3.0										
	グルタミン酸二酢酸	2.6										
		2.2										
実施例37	エチレングリコール	59.2	95	1.0	3.8	1005	7.1	6.2	944	7.7	2.4	
	ホスホノブタン-1,2,4-トリカルボン酸	27.6										
	ニトロ安息香酸アンモニウム	9.3										
	ヒドロキシベンジルアルコール	1.5										
	グルタミン酸二酢酸	1.5										
実施例38	エチレングリコール	39.6	39	1.0	3.6	1018	5.8	6.3	937	6.4	2.1	
	ホスホノブタン-1,2,4-トリカルボン酸アンモニウム	40.0										
	ニトロフェノール	19.0										
	ヒドロキシベンジルアルコール	0.4										
		1.0										
実施例39	エチレングリコール	48.7	68	1.0	3.7	1013	6.4	6.4	942	7.0	2.3	
	ホスホノブタン-1,2,4-トリカルボン酸アンモニウム	39.4										
	ニトロ安息香酸	9.0										
	ヒドロキシベンジルアルコール	0.4										
		1.0										

[0055] examples 40-49 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of a nitro compound and glucono lactone in this example, the presentation of the electrolytic solution to be used was changed into the 5th following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 5th following table. In addition, in the 5th following table, the test result of said examples 1-4 of a comparison is also united and indicated.

[0056]

[Table 9]

[0057]
[Table 10]

第5表

例の番号	電解液の組成〔重量%〕		比抵抗30℃ (Ω・cm)	Z比		初期値			105℃ 3000時間後			
				120Hz [-40／20℃]	100kHz [-40／20℃]	容量 〔μF〕	tanδ 〔%〕	漏れ電流 〔μA〕	容量 〔μF〕	tanδ 〔%〕	漏れ電流 〔μA〕	外観
比較例1	エチレングリコール 水 アジピン酸アンモニウム	60.0 30.0 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 水 アジピン酸アンモニウム	45.0 40.0 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 水 アジピン酸アンモニウム	30.0 50.0 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
比較例4	エチレングリコール 水 アジピン酸アンモニウム ニトロ安息香酸	29.0 50.0 20.0 1.0	20	1.0	7.9	1022	4.8	7.0	ガス発生により1000時間までに全数防爆弁作動			
実施例40	エチレングリコール 水 ギ酸アンモニウム 次亜リン酸 グルコノラクトン n－ニトロアセトフェノン ニトロ安息香酸	25.0 68.0 4.4 0.4 0.2 1.0 1.0	28	1.1	4.6	1044	5.6	7.7	898	6.4	2.3	
実施例41	エチレングリコール 水 グルタル酸アンモニウム スルファミン酸 グルコノラクトン ニトロフェノール n－ニトロアセトフェノン	20.0 60.0 16.2 1.6 0.2 1.0 1.0	26	1.1	4.4	1034	5.5	7.2	900	6.3	2.3	
実施例42	エチレングリコール 水 アジピン酸アンモニウム グルコノラクトン ニトロ安息香酸 ニトロフェノール	15.0 60.0 22.8 0.2 1.0 1.0	23	1.1	3.9	1025	5.4	7.0	902	6.2	2.0	
実施例43	エチレングリコール 水 コハク酸アンモニウム ベンゼンスルホン酸 グルコノラクトン ニトロフェノール	22.0 50.0 25.0 0.4 0.6 2.6	21	1.1	3.8	1020	5.2	6.8	918	6.0	2.0	

第5表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃ (Ω・cm)	Z比		初期値			105℃ 3000時間後		
				120Hz/20℃ [-40℃]	100kHz [-40℃/20℃]	容量 (μF)	tanδ (%)	漏れ電流 (μA)	容量 (μF)	tanδ (%)	漏れ電流 (μA)	外観
実施例44	エチレングリコール	48.0	161	1.2	5.6	1024	8.8	6.2	932	9.6	1.9	
	ホウ酸アンモニウム	40.0										
	グルコノラクトン	10.8										
	ニトロ安息香酸	0.2										
	ポリエチレングリコール	1.0										
実施例45	エチレングリコール	54.0	29	1.0	3.7	1010	5.6	6.1	929	6.4	2.0	
	ホウ酸アンモニウム	30.0										
	スルファミン酸アンモニウム	14.4										
	リン酸グルコノラクトン	0.4										
	m-ニトロアセトフェノン	0.2										
	ポリエチレングリコール	1.0										
実施例46	エチレングリコール	60.0	58	1.0	3.6	1003	6.2	6.3	933	7.0	2.1	
	アジピン酸アンモニウム	20.0										
	ホウ酸グルコノラクトン	16.4										
	ニトロ安息香酸	0.4										
	ポリエチレングリコール	0.2										
		1.0										
実施例47	エチレングリコール	62.0	95	1.0	3.8	1005	6.9	6.2	940	7.7	2.1	
	アジピン酸アンモニウム	27.0										
	グルコノラクトン	6.8										
	m-ニトロアセトフェノン	0.2										
	ニトロフェノール	1.0										
	ポリエチレングリコール	1.0										
実施例48	エチレングリコール	40.0	40	1.0	3.6	1018	5.8	6.4	937	6.4	2.2	
	ホウ酸アンモニウム	40.0										
	マルタル酸アンモニウム	18.8										
	グルコノラクトン	0.2										
	ニトロ安息香酸	1.0										
	ポリエチレングリコール	1.0										
実施例49	エチレングリコール	50.0	68	1.0	3.7	1013	6.5	6.4	942	7.1	2.3	
	ホウ酸アンモニウム	39.4										
	アジピン酸アンモン	9.0										
	スルファミン酸	0.4										
	グルコノラクトン	0.2										
	ニトロフェノール	1.0										

[0058] examples 50-59 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness brought about with the combination of the arbitration of various kinds of additives in this example, the presentation of the electrolytic solution to be used was changed into the 6th following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 6th following table. In addition, in the 6th following table, the test result of said examples 1-4 of a comparison is also united and indicated.

[0059]

[Table 11]

第6表

例の番号	電解液の組成〔重量%〕	比抵抗30℃〔Ω・cm〕	Z比 120Hz〔-40／20℃〕	Z比 100kHz〔-40／20℃〕	初期値 容量〔μF〕	初期値 tanδ〔%〕	初期値 漏れ電流〔μA〕	105℃ 3000時間後 容量〔μF〕	105℃ 3000時間後 tanδ〔%〕	105℃ 3000時間後 漏れ電流〔μA〕	105℃ 3000時間後 外観
比較例1	エチレングリコール 60.0 水 30.0 アジピン酸アンモニウム 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 45.0 水 40.0 アジピン酸アンモニウム 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 30.0 水 50.0 アジピン酸アンモニウム 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
比較例4	エチレングリコール 29.0 水 50.0 アジピン酸アンモニウム 20.0 ニトロ安息香酸 1.0	20	1.0	7.9	1022	4.8	7.0	ガス発生により1000時間までに全数防爆弁作動			
実施例50	エチレングリコール 24.0 水 68.0 ギ酸アンモニウム 4.4 次亜リン酸 0.4 エチレンジアミン四酢酸 0.5 グルタミン酸二酢酸 0.2 グルコノラクトン 0.2 n－ニトロアセトフェノン 1.0 ニトロ安息香酸 1.0	28	1.1	4.6	1044	5.3	7.7	898	6.1	2.3	
実施例51	エチレングリコール 18.0 水 60.0 グルタル酸アンモニウム 16.2 スルファミン酸 1.6 ジエチレントリアミン五酢酸 1.0 フルクトース 1.0 グルコノラクトン 0.2 ニトロフェノール 1.0 n－ニトロアセトフェノン 1.0	26	1.1	4.4	1034	5.2	7.2	900	6.0	2.3	
実施例52	エチレングリコール 15.0 水 57.5 アジピン酸アンモニウム 22.8 エチレンジアミン四酢酸 2.0 ヒドロキシベンジルアルコール 0.5 グルコノラクトン 0.2 ニトロ安息香酸 1.0 ニトロフェノール 1.0	23	1.1	3.9	1025	5.5	7.0	902	6.3	2.0	

[0060]
[Table 12]

第6表（続き）

例の番号	電解液の組成〔重量%〕	比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 3000時間後			
			120Hz [-40/20℃]	100kHz [-40/20℃]	容量〔μF〕	tanδ (%)	漏れ電流〔μA〕	容量〔μF〕	tanδ (%)	漏れ電流〔μA〕	外観
実施例53	エチレングリコール 20.6 水 50.0 コハク酸アンモニウム 25.0 エチレンジアミン二酢酸 1.0 グルタミン酸二酢酸 0.2 ベンゼンスルホン酸 0.4 グルコノラクトン 0.2 ニトロフェノール 2.6	21	1.1	3.8	1020	5.4	6.8	918	6.2	2.0	
実施例54	エチレングリコール 46.7 水 40.0 ホウ酸アンモニウム 10.8 エチレンジアミン二酢酸 0.8 ヒドロキシベンジルアルコール 0.5 グルコノラクトン 0.2 ニトロ安息香酸 1.0	161	1.2	5.6	1024	8.9	6.2	932	9.7	1.9	
実施例55	エチレングリコール 52.0 水 30.0 スルファミン酸アンモニウム 14.4 キシロース 0.5 EDTPO 1.0 グルタミン酸二酢酸 0.5 リン酸 0.4 グルコノラクトン 0.2 n－ニトロアセトフェノン 1.0	29	1.0	3.7	1010	5.2	6.1	929	6.0	2.0	
実施例56	エチレングリコール 57.5 水 20.0 アジピン酸アンモニウム 18.4 エチレンジアミン四酢酸 1.5 ヒドロキシベンジルアルコール 0.5 グルタミン酸二酢酸 0.5 ホウ酸 0.4 グルコノラクトン 0.2 ニトロ安息香酸 1.0	58	1.0	3.6	1003	6.1	6.3	933	6.9	2.1	

[0061]
[Table 13]

第6表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃ (Ω・cm)	Z比		初期値				105℃ 3000時間後			
				120Hz (-40/20℃)	100kHz (-40/20℃)	容量 (μF)	tanδ (%)	漏れ電流 (μA)		容量 (μF)	tanδ (%)	漏れ電流 (μA)	外観
実施例57	エチレングリコール	57.5	85	1.0	3.8	1005	6.0	6.2		940	7.6	2.1	
	水	27.6											
	ジエチレントリアミン五酢酸	8.8											
	グルコースペンタエトキシルアルコール	3.0											
	ビグルコノラクトフェノン	1.5											
	ニトロアセトフェノン	1.0											
実施例58	エチレングリコール	37.9	40	1.0	3.6	1018	4.8	6.4		937	5.4	2.2	
	水	40.1											
	エチレンジアミン二酢酸	0.5											
	アルタトリエン酸二酢酸	0.4											
	グルタル酸アンモン	18.8											
	グルコノラクトン	0.2											
	ニトロ安息香酸	1.0											
実施例59	エチレングリコール	47.5	68	1.0	3.7	1013	6.8	6.4		942	7.4	2.3	
	水	39.4											
	アジピン酸アンモニウム	9.0											
	ビグルコノペンタエトキシルアルコール	1.0											
	EDTPO	0.5											
	スルファミン酸	0.4											
	ニトロフェノール	0.2											

[0062] the examples 5-8 of a comparison, and examples 60-62 -- although the technique of a publication was repeated in said example 1, in order to check the further improvement in a life property in this example, measurement of the specific value in the elevated-temperature neglect conditions (1000 hours pass at 105 degrees C) of adoption was changed and carried out after 6000-hour progress by 105 degrees C in the example 1. A result like the publication to the 7th following table was obtained.

[0063]

[Table 14]

第7表

例の番号	電解液の組成〔重量%〕		比抵抗(30℃)〔Ω・cm〕	Z比		初期値				105℃ 6000時間後			
				120Hz/20℃ / -40℃	100kHz/20℃ / -40℃	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕		容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	外観
比較例5	エチレングリコール	60.0	85	1.3	36.1	1008	7.0	6.5		ガス発生により500時間までに全数防爆弁作動			
	水	30.0											
	アジピン酸アンモニウム	10.0											
比較例6	エチレングリコール	45.0	40	1.1	9.7	1014	5.7	6.1		ガス発生により250時間までに全数防爆弁作動			
	水	40.0											
	アジピン酸アンモニウム	15.0											
比較例7	エチレングリコール	30.0	20	1.0	7.9	1023	4.7	6.9		ガス発生により250時間までに全数防爆弁作動			
	水	50.0											
	アジピン酸アンモニウム	20.0											
比較例8	エチレングリコール	29.0	20	1.0	7.9	1022	4.8	7.0		ガス発生により1000時間までに全数防爆弁作動			
	水	50.0											
	アジピン酸アンモニウム	20.0											
	ニトロ安息香酸	1.0											
実施例60	エチレングリコール	25.0	28	1.1	4.6	1044	5.4	7.7		855	6.6	2.1	
	水	68.6											
	次亜リン酸アンモニウム	4.6											
	ニトロアセトフェノン	0.4											
	ニトロ安息香酸	1.0											
実施例61	エチレングリコール	15.0	23	1.1	3.9	1025	5.3	7.0		668	8.2	1.6	
	水	60.0											
	アジピン酸アンモニウム	23.0											
	ニトロフェノール	1.0											
実施例62	エチレングリコール	40.0	40	1.0	3.6	1018	5.8	6.4		632	9.1	1.1	
	水	40.0											
	グルタル酸アンモニウム	19.0											
	ニトロ安息香酸	1.0											

[0064] In the 7th table of the above, the examples 5-8 of a comparison are equivalent to said examples 1-4 of a comparison, respectively, and examples 60-62 are equivalent to said examples 1, 3, and 9, respectively. Although the fall of capacity was accepted to each having become use impossible by the time 250 to 500 hours passed in the comparisons 5-7 which used the electrolytic solution which does not add a nitro compound so that I might be understood from the result of a publication in the case of the capacitor of examples 60-62, it was usable also after 6000-hour progress. Moreover, by having used together the carboxylic acid of an organic system electrolyte, or the salt and the inorganic acid of an inorganic system electrolyte to what should be observed shows that the life property of an electrolytic capacitor is improved further.

[0065]

[Effect of the Invention] It excels in the low-temperature property which according to this invention is low impedance and is expressed with the impedance ratio in low temperature and ordinary temperature as explained above, and a life

property is good and the electrolytic solution for a drive for electrolytic capacitors which can do so the hydrogen gas absorption effectiveness of having excelled even when an electrolytic capacitor was used under the time of using the electrolytic solution which moreover used the solvent with the large content rate of water, or hot environments is offered. Moreover, according to this invention, by using such the electrolytic solution, it excels in a low-temperature property, and a life property is good and the electrolytic capacitor of the high-reliability which does not have the fault which results from an operation of the water used in a solvent, and is generated, especially an aluminium electrolytic capacitor are offered by low impedance.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to an electrolytic capacitor. When it states in more detail, this invention is low impedance, and it excels in a low-temperature property, and a life property is related with the electrolytic capacitor with which the good electrolytic solution for an electrolytic capacitor drive and good it were used, especially an aluminium electrolytic capacitor.
[0002]
[Description of the Prior Art] A capacitor is one of the common electrical parts, and is widely used mainly for the object for power circuits, and the noise filters of a digital circuit in various electrical and electric equipment and electronic products. A capacitor is divided roughly into an electrolytic capacitor and other capacitors (a ceramic condenser, film capacitor, etc.).
[0003] When there is a thing of various classes in the electrolytic capacitor by which current use is carried out and the example is shown, they are an aluminium electrolytic capacitor, a wet tantalum electrolytic capacitor, etc. In addition, what can expect the effectiveness excellent in especially this invention shall point out an aluminium electrolytic capacitor except for the case where there is a notice especially, when it is an aluminium electrolytic capacitor, this invention is hereafter explained with reference to this kind of electrolytic capacitor and it calls it an "electrolytic capacitor."
[0004] Typically, the conventional aluminium electrolytic capacitor can be manufactured by using the anode plate foil which anodized the front face of the aluminium foil and gave the coat, and the cathode foil etched in the front face, after etching high grade aluminium foil and making the surface area increase. Subsequently, the component of the structure which have arranged the anode plate foil and cathode foil which were obtained face to face, and the separator (isolation paper) was made to intervene in the middle of those foils further, and was wound, and nothing and this component are rolled, and the electrolytic solution is sunk into the component of ****** structure. The component after electrolytic-solution sinking in is held in a case (generally product made from aluminum), and it seals with an elastic obturation object, and an electrolytic capacitor is completed. In addition, there are also things other than such winding structure in an electrolytic capacitor.
[0005] In the above electrolytic capacitors, the big factor as which the property of the electrolytic solution determines the engine performance of an electrolytic capacitor is made. in connection with especially the miniaturization of an electrolytic capacitor in recent years, an anode plate foil or a cathode foil is dirty -- SIG -- since what has a high scale factor comes to be used and the resistivity of the body of a capacitor is large, as the electrolytic solution used for this, the thing of high conductivity which has small resistivity (specific resistance) is always required.
[0006] As for the electrolytic solution of an old electrolytic capacitor, what dissolved carboxylic acids, such as an adipic acid and a benzoic acid, or the ammonium salt of those in the solvent which added water to about 10 % of the weight, and constituted ethylene glycol (EG) in this as a main solvent as an electrolyte is common. In such the electrolytic solution, specific resistance is 1.5 ohm-m (150 ohm-cm) extent.
[0007] On the other hand, in order to fully demonstrate the engine performance in a capacitor, reducing an impedance (Z) is called for continuously. Various factors determine an impedance, for example, if the electrode surface product of a capacitor increases, it will fall, therefore if it becomes a large-sized capacitor, low impedance-ization will be attained naturally. Moreover, there is also approach which attains low impedance-ization by improving a separator. But in the small capacitor, the specific resistance of the electrolytic solution serves as a big rule factor of an impedance especially.

[0008] Recently, the electrolytic solution of low specific resistance which used the organic solvent of a non-proton

system, for example, GBL etc., (gamma-butyrolactone) is also developed (for example, please refer to JP,62-145713,A, JP,62-145714,A, and JP,62-145715,A). However, compared with the solid-state capacitor by which specific resistance used the electronic conductor of 1.0 or less ohm-cm, the impedance is far inferior in the capacitor using this non-proton system electrolytic solution.

[0009] Moreover, a ratio with an impedance [in -40 degrees C / in / in order to use the electrolytic solution, the low-temperature property of an aluminium electrolytic capacitor is bad, and / 100kHz], and an impedance of 20 degrees C: About 40 and the quite large thing of Z (-40 degrees C)/Z (20 degrees C) are the actual condition. In view of such the present condition, it is low specific resistance in current and low impedance, and to offer the aluminium electrolytic capacitor which was moreover excellent in the low-temperature property is desired.

[0010] Furthermore, the water used as a part of the solvent in the electrolytic solution of an aluminium electrolytic capacitor is the activity matter chemically for the aluminum which constitutes an anode plate foil and a cathode foil, therefore has the problem of reacting with an anode plate foil and a cathode foil, generating hydrogen gas or reducing a property remarkably. In order to solve conventionally the problem of the hydrogen gas generated in the load test of an electrolytic capacitor etc., the attempt which absorbs the generated hydrogen gas is also made. For example, JP,59-15374,B is indicating the electrolytic solution for an electrolytic capacitor drive characterized by having added the ammonium salt of a carboxylic acid and a carboxylic acid to the solvent which added 5 - 20% of the weight of water to ethylene glycol, having prepared buffer solution, and adding and preparing further 0.05 - 3% of the weight of p-nitrophenol. If this electrolytic solution is used, generation of a boehmite reaction and generating of hydrogen gas can be controlled, and the electrolytic capacitor which made the low-temperature property, the life property, etc. improve can be offered.

[0011] Moreover, the electrolytic solution for an electrolytic capacitor drive which can do so the corrosion prevention effectiveness which was excellent to washing by halogenated hydrocarbon characterized by adding o-nitro anisole to the electrolytic solution which comes to dissolve various kinds of organic acids, an inorganic acid, or its salt as a solute in the solvent which makes ethylene glycol a subject is indicated by JP,63-14862,A. o-nitro anisole used for this official report as corrosion inhibitor here has the hydrogen gas absorption effectiveness, the hydrogen gas generated from the interior while using an electrolytic capacitor is absorbed, and it is indicated that it is effective in the ability to control valve-opening accident and electrostatic-capacity change.

[0012] According to research of this invention persons, however, p-nitrophenol and o-nitro anisole Although it is said that the early hydrogen gas absorption effectiveness can be done so in the electrolytic solution for an electrolytic capacitor drive with the low concentration of water which is generally used conventionally When the amount of the water occupied to the solvent in the electrolytic solution became more than 20 % of the weight or it, or when an electrolytic capacitor was used over a long period of time under hot environments, the hydrogen gas absorption effectiveness which may be satisfied was shown, and it became clear that it was unmaintainable.

[0013]

[Problem(s) to be Solved by the Invention] This invention is a thing aiming at solving a trouble of a Prior art which was described above. The 1st purpose It excels in the low-temperature property which is low impedance and is expressed with the impedance ratio in low temperature and ordinary temperature. A life property is good and it is in offering the electrolytic solution for a drive for electrolytic capacitors which can do so the hydrogen gas absorption effectiveness of having excelled even when an electrolytic capacitor was used under the time of using the electrolytic solution which moreover used the mixed solvent with the large content rate of water, or hot environments.

[0014] Another purpose of this invention is to offer the electrolytic capacitor which used the electrolytic solution of this invention, especially an aluminium electrolytic capacitor.

[0015]

[Means for Solving the Problem] The solvent with which this invention consists of 20 - 80% of the weight of an organic solvent, and 80 - 20% of the weight of water in the one field, As opposed to the electrolytic solution containing at least one sort of electrolytes chosen from the group which consists of a carboxylic acid or its salt and an inorganic acid, or its salt It is in the electrolytic solution for an electrolytic capacitor drive characterized by adding at least one sort of nitro compounds chosen from the group which consists of a nitrophenol, a nitro benzoic acid, a dinitro benzoic acid, a nitro acetophenone, and a nitro anisole.

[0016] It is still more desirable to use said nitro compound with combination with the component of the other electrolytic solutions, in the electrolytic solution of this invention, combining two sorts or the nitro compound beyond it, in order to be able to do so the hydrogen gas absorption effectiveness of having excelled even if it used it independently and to acquire more remarkable effectiveness. When adding and using it for the electrolytic solution of this invention, as for a nitro compound, it is desirable to add and use it in 0.01 - 5% of the weight of an amount on the

basis of the whole quantity of the electrolytic solution.

[0017] The organic solvent used together with water for formation of a mixed solvent is a proton system solvent, a non-proton system solvent, or its mixture preferably. That is, a proton system solvent and a non-proton system solvent may be used independently, otherwise may be used for arbitration combining two sorts or more than it if needed, respectively. Here, a proton system solvent is an alcoholic compound preferably, and a non-proton system solvent is a lactone compound preferably.

[0018] Furthermore, the carboxylic acid used as an electrolyte in the electrolytic solution of this invention or its salt is one sort preferably chosen from the group which consists of formic acid, an acetic acid, a propionic acid, butanoic acid, p-nitrobenzoic acid, a salicylic acid, a benzoic acid, oxalic acid, a malonic acid, a succinic acid, a glutaric acid, an adipic acid, a fumaric acid, a maleic acid, a phthalic acid, an azelaic acid, a citric acid, oxy-butanoic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt, or more than it.

[0019] Moreover, the inorganic acid similarly used as an electrolyte or its salt is one sort chosen from a phosphoric acid, phosphorous acid, hypophosphorous acid, a boric acid, sulfamic acid and its ammonium salt, sodium salt, potassium salt, an amine salt, and alkyl ammonium salt, or more than it preferably. moreover -- the electrolyte of this invention -- said nitro compound -- adding -- the following group:(1) chelate compound, (2) saccharides, (3) hydroxybenzyl alcohol and (or) L-glutamic acid 2 acetic acid or its salt, (4) gluconic acids, and (or) glucono lactone -- since -- the additive chosen may be included if needed. These additives may be used independently or may be used for arbitration combining two sorts or the additive beyond it.

[0020] This invention is in the electrolytic capacitor which comes to contain the electrolytic solution for a drive of this invention for electrolytic capacitors in the field of another further again.

[0021]

[Embodiment of the Invention] In the electrolytic solution for an electrolytic capacitor drive of this invention, it considers as the solvent for dissolving an electrolyte, it carries out, and a solvent with the high moisture concentration which consists of mixture of an organic solvent and water is used. As an organic solvent, as described above, it is independent, or a proton system solvent or a non-proton system solvent can be combined and used for arbitration. An alcoholic compound can be mentioned as an example of a suitable proton system solvent. Moreover, although not necessarily limited to what is enumerated below as a concrete example of the alcoholic compound which can be used advantageously here, trihydric alcohol, such as dihydric alcohol (glycol), such as monohydric alcohol, such as ethyl alcohol, propyl alcohol, and butyl alcohol, ethylene glycol, a diethylene glycol, triethylene glycol, and propylene glycol, and a glycerol, can be mentioned. Moreover, a lactone compound can be mentioned as an example of a suitable non-proton system solvent. Moreover, although not necessarily limited to what is enumerated below as a concrete example of the lactone compound which can be used advantageously here, the intramolecular polarization compound of gamma-butyrolactone or others can be mentioned. In using one or more sorts chosen from a proton system solvent and a non-proton system solvent in operation of this invention If it explains more concretely, one sort of proton system solvents may be used. One sort of non-proton system solvents may be used, two or more sorts of proton system solvents may be used, and two or more sorts of non-proton system solvents may be used, or the mixed stock of one or more sorts of proton system solvents and one or more sorts of non-proton system solvents may be used.

[0022] In the electrolytic solution of this invention, the water other than the above-mentioned organic solvent is used as a solvent component, and, especially in the case of this invention, it is distinguished from the electrolytic solution conventional at the point of using together a lot of water in comparison. In this invention, by using such a solvent, the congealing point of a solvent can be reduced, the specific resistance property of the electrolytic solution in low temperature can be improved by that cause, and the good low-temperature property by which the difference of the specific resistance in low temperature and ordinary temperature is shown according to a small thing can be realized. It is suitable for the content of the water in the electrolytic solution that it is in 20 - 80% of the weight of the range, and the remainder is an organic solvent. Also when there are few contents of water than 20 % of the weight and it exceeds 80 % of the weight, it becomes inadequate [the degree of the freezing point depression of the electrolytic solution], and it becomes difficult to acquire the good low-temperature property of an electrolytic capacitor. The content of suitable water is 30 - 80% of the weight of the range, and the content of the most suitable water is 45 - 80% of the weight of the range rather than it can set in an aquosity mixed solvent.

[0023] as the electrolyte in the electrolytic solution of this invention -- an organic acid -- especially, a carboxylic acid or its salt and an inorganic acid, or its salt may be used preferably, and these electrolyte components may be used independently, or you may use it combining two or more sorts. also although kicked, the carboxylic acid which the dicarboxylic acid represented by the monocarboxylic acid which is not necessarily limited to what is enumerated below as an example of a carboxylic acid usable as an electrolyte component, and which is represented by formic acid, an

acetic acid, a propionic acid, butanoic acid, p-nitrobenzoic acid, a salicylic acid, and the benzoic acid, oxalic acid and a malonic acid, a succinic acid, a glutaric acid, an adipic acid, a fumaric acid, a maleic acid, a phthalic acid, and the azelaic acid was contained, for example, had functional groups, such as hydroxyl, like a citric acid and oxy-butanoic acid is also usable

[0024] Moreover, although not necessarily limited to what is enumerated below as an example of the same inorganic acid usable as an electrolyte component, a phosphoric acid, phosphorous acid, hypophosphorous acid, a boric acid, sulfamic acid, etc. are contained. Furthermore, although various salts can be used as a salt of a carboxylic acid which was described above, or an inorganic acid, as a suitable salt, ammonium salt, sodium salt, potassium salt, an amine salt, alkyl ammonium salt, etc. are contained, for example. Also in such a salt, it is more desirable to use ammonium salt.

[0025] Furthermore, in addition, if an inorganic acid or its salt is used as an electrolyte in operation of this invention, the depression of freezing point of the electrolytic solution can be expected, therefore it can contribute to the further improvement in the low-temperature property of the electrolytic solution. Moreover, especially use of an inorganic acid or its salt deserves attention also in that the hydrogen gas absorption capacity (it explains in full detail below) originating in the nitro compound used in this invention is maintainable over a long period of time.

[0026] Moreover, if it is used for the carboxylic acid which described above an electrolyte like such an inorganic acid or its salt according to research of this invention persons, or an electrolyte like the salt, combining, as compared with the case where they are used independently, the effectiveness that the life of an electrolytic capacitor is notably extensible can also be acquired. Furthermore, in the conventional electrolytic capacitor, from problems, such as electric conductivity, although mainly used for the electrolytic capacitor of the type of inside - the high voltage (160-500 volts), the electrolyte of an inorganic-acid system can be advantageously used also in the electrolytic capacitor of the type of a low battery (less than 160 volts), when electrolytic combination use is performed like this invention.

[0027] The amount of the electrolyte used in the electrolytic solution of this invention can determine the optimal amount suitably according to various kinds of factors, such as a class of the class of the property required of the electrolytic solution or the capacitor finally obtained, and solvent to be used, a presentation and an amount, and electrolyte to be used. For example, as described above, when a carboxylic-acid system uses it combining the electrolyte of an inorganic-acid system, although it is said in the large range that the content of the electrolyte of the inorganic-acid system in a mixed electrolyte can be changed, it is usually desirable [a content] that the electrolyte of an inorganic-acid system is contained on the basis of the electrolytic whole quantity in about 0.1 - 15% of the weight of the range.

[0028] The aquosity mixed solvent with which especially the electrolytic solution of this invention consists of the electrolytic solution of a specific presentation which was described above, i.e., 20 - 80% of the weight of an organic solvent and 80 - 20% of the weight of water, As opposed to the electrolytic solution containing at least one sort of electrolytes chosen from the group which consists of a carboxylic acid or its salt and an inorganic acid, or its salt A nitrophenol, for example, p-nitrophenol, a nitro benzoic acid, For example, it is characterized by adding as an additive of addition of at least one sort of nitro compounds chosen from compound groups, such as p-nitrobenzoic acid, a dinitro benzoic acid, a nitro acetophenone, for example, p-nitro acetophenone, and a nitro anisole.

[0029] Although the remarkable hydrogen gas absorption effectiveness was especially checked in this invention when the above-mentioned nitro compound group was used, the exact circumstances have still come to become clear. However, this is understood to be what has a big factor in doing the hydrogen gas absorption effectiveness so to the timing from which the substituent contained in each nitro compound differs from experience of this invention persons. In addition, the nitro compound used here can double and have the operation (if it puts in another way halogen prehension operation) which controls that a component is made to corrode by operation of the halogenated hydrocarbon used on the occasion of washing of a printed circuit board, for example, trichloroethane etc.

[0030] Also although the above-mentioned nitro compound can do so the hydrogen gas absorption effectiveness, a halogen prehension operation, etc. which may be satisfied even if it uses it independently since the specific presentation effective in the effectiveness of this invention is adopted as the electrolytic solution itself when adding it to the electrolytic solution of this invention According to the knowledge of this invention persons' this time, effectiveness with still more desirable using it combining two sorts or the nitro compound beyond it is expectable. Generally, mixing and using two sorts of nitro compounds is recommended. Moreover, as for a nitro compound, it is usually desirable to add and use it in 0.01 - 5% of the weight of an amount on the basis of the whole quantity of the electrolytic solution. If the addition of a nitro compound is less than 0.01 % of the weight, even if it can hardly acquire expected effectiveness but exceeds 5 % of the weight on the contrary, the further improvement in expected effectiveness cannot be expected, but a bad influence will be made to other properties depending on the case, and things will also be considered.

[0031] having used the nitro compound independently, as the Prior art, by the way, referred to absorption of aluminum

and the hydrogen gas generated in the reaction time of water, when use of a nitro compound was explained further -- if -- it is in the inclination which the content of the water in the solvent to be used increases for it to be alike, to take and for an absorption effect to fall, and this fall inclination becomes remarkable when the electrolytic solution sets under hot environments. However, the problem which originates in independent use of such a nitro compound, and is generated is solvable by [as / in this invention] using it combining two sorts or the nitro compound beyond it. In the case of the electrolytic solution of this invention, hydrogen gas absorption capacity was farther [than the conventional independent use] actually maintainable over the long period of time with use of two or more sorts of nitro compounds under elevated-temperature neglect.

[0032] Moreover, the effectiveness which was excellent in this invention in absorption of hydrogen gas was able to be checked also in relation with the electrolyte used together. In the conventional electrolytic solution, the technique added only to the electrolyte of an inorganic-acid system, respectively has been adopted [nitro compound / the electrolyte of a carboxylic-acid system, or one kind of] only in one kind of nitro compound. However, although the same was said of the electrolytic solution with which the hydrogen gas absorption effectiveness may be satisfied with the above technique of the effectiveness cannot be acquired, and the electrolyte of a carboxylic-acid system and the electrolyte of an inorganic-acid system are intermingled when there were many contents of the water in a solvent In the case of the electrolytic solution of this invention (only one kind of nitro compound is used), also in such a carboxylic-acid system / the inorganic-acid system mixture electrolytic solution, hydrogen gas absorption capacity was farther [than the conventional independent use] maintainable over the long period of time to the surprising thing.

[0033] The electrolytic solution of this invention can be contained as an additive of addition of the component except having described above if needed. The following compounds are included so that this invention persons may invent on this invention and a coincidence target and it may be indicated as a suitable additive by invention which carried out patent application independently, for example.

(1) A chelate compound (EDTA), for example, ethylenediaminetetraacetic acid, a transformer -1 and 2-diamino cyclohexane - N, N, N', and N' -4 acetic-acid monohydrate (CyDTA) -- A dihydroxyethyl glycine (DHEG), ethylenediamine tetrakis (methylene phosphonic acid) (EDTPO), Diethylenetriamine - N, N, N', N"N" -5 acetic acid (DTPA), A diamino propanol tetraacetic acid (DPTA-OH), ethylenediamine 2 acetic acid (EDDA), Ethylenediamine-N and N'-screw (methylene phosphonic acid) 1 / 2 hydrate (EDDPO), a glycol ether diamine tetraacetic acid (GEDTA), hydroxyethyl ethylenediamine triacetic acid (EDTA-OH), etc. As for a chelate compound, generally, it is desirable to add in 0.01 - 3% of the weight of the range. Such a chelate compound can bring about effectiveness, such as an improvement (since a solvent is the presentation near non-******, change of the impedance in ordinary temperature and low temperature becomes small) of the reinforcement of the capacitor by control of the hydration reaction of (Aluminum aluminum) electrode foil of a low impedance capacitor, and the low-temperature property of an electrolytic capacitor, and corrosion-resistant improvement.

[0034] (2) A saccharide, for example, a glucose, a fructose, a xylose, a galactose, etc. As for a saccharide, generally, it is desirable to add in 0.01 - 5% of the weight of the range. Such a saccharide can bring about effectiveness, such as an improvement (since a solvent is the presentation near non-******, change of the impedance in ordinary temperature and low temperature becomes small) of disassembly of the electrolyte by the reinforcement of the capacitor by control of the hydration reaction of aluminum electrode foil of a low impedance capacitor, and addition of a saccharide, for example, a carboxylic acid, control of activation, and the low-temperature property of an electrolytic capacitor.

[0035] (3) Hydroxybenzyl alcohol, for example, 2-hydroxybenzyl alcohol, L-glutamic acid 2 acetic acid, or its salt. As for this additive, generally, it is desirable to add in 0.01 - 5% of the weight of the range. Such an additive can bring about effectiveness, such as an improvement (since a solvent is the presentation near non-******, change of the impedance in ordinary temperature and low temperature becomes small) of the reinforcement of the capacitor by control of the hydration reaction of aluminum electrode foil of a low impedance capacitor, and the low-temperature property of an electrolytic capacitor.

[0036] The above-mentioned compound (1) - (3) can do much remarkable effectiveness so, respectively, when adding them to the electrolytic solution of this invention, and even when the nitro compound is not contained in the electrolytic solution, it can expect much of the effectiveness. Moreover, according to research of this invention persons, such remarkable effectiveness especially can be acquired when it combines with one gluconic acids following at least one sort and glucono lactone of above-mentioned compound (1) - (3).

[0037] furthermore, the electrolytic solution of this invention is added to an additive (also in independent addition of a nitro compound, it contains) which was described above, and is independent in (4) gluconic acids, glucono lactone, etc. if needed -- or it can combine and contain. As for this kind of additive, generally, it is desirable to add in 0.01 - 5% of the weight of the range. When it is added and included in the electrolytic solution of this invention, a gluconic acid and

glucono lactone can be added to effectiveness peculiar to this invention called the reinforcement of an electrolytic capacitor, the improvement in a low-temperature property, the outstanding hydrogen gas absorption effectiveness, etc., and can bring about the remarkable effectiveness of corrosion-resistant improvement further.

[0038] An additive in ordinary use may be further added also to everything but the above-mentioned additive further again in the field of an aluminium electrolytic capacitor or other electrolytic capacitors. As an additive of suitable daily use, mannite, a silane coupling agent, water-soluble silicone, a polyelectrolyte, etc. can be mentioned, for example. the electrolytic solution of this invention can mix various kinds of components which were described above in order of arbitration, and can prepare them by dissolving, and there is as it is about the conventional technique fundamentally -- it is -- it can be used, being able to change. For example, after preparing a solvent with the high moisture concentration which is the mixture of an organic solvent and water, it can prepare easily by dissolving the additive of arbitration in the obtained solvent an electrolyte, a nitro compound, and if needed.

[0039] The electrolytic capacitor of this invention as well as the above-mentioned electrolytic solution can be manufactured according to a technique in ordinary use. For example, the anode plate foil manufactured from the aluminum which oxidized and dielectric-ized the front face, The cathode foil which has the etching front face made from aluminum which counters the field which this anode plate foil dielectric-ized, After sinking the electrolytic solution of this invention into the component of the wound structure which was constituted from a separator (isolation paper) by which it is placed between the questions of an anode plate foil and a cathode foil, an aluminium electrolytic capacitor can be manufactured by sealing the component in a suitable case. In the aluminium electrolytic capacitor obtained, since the electrolytic solution of this invention is used, the effectiveness of the improvement in a low-temperature property by the mixed solvent of an organic solvent and water, the hydrogen gas absorption effectiveness by addition of a nitro compound, and the effectiveness of the reinforcement and low-impedance-izing by hydration reaction control by use of a specific electrolyte can be attained.

[0040]

[Example] Next, an example explains this invention further. Needless to say, the example hung up here is for illustrating this invention, and does not tend to limit this invention.

The aluminium electrolytic capacitor of example 1 winding structure was manufactured according to the following procedure.

[0041] First, etching processing of the aluminium foil was carried out electrochemically, the oxide film was formed in the front face, the lead tab for electrode cash drawers was attached after that, and the aluminum anode plate foil was made. Next, after performing etching processing to an electrochemistry target too at another aluminium foil, the **** attachment ** aluminum cathode foil was made for the lead tab for electrode cash drawers. Then, the capacitor element was made by winding on both sides of a separator (isolation paper) between an anode plate foil and a cathode foil. And after sinking into this capacitor element the electrolytic solution which showed the presentation in the 1st following table, as the lead tab for electrode cash drawers came out of the case, it held in the closed-end aluminum case, and to it, opening of this case was sealed with the elastic obturation object, and the electrolytic capacitor (10WV-1000micro F) of winding structure was produced to it.

[0042] When the specific resistance in 30 degrees C of the electrolytic solution used by this example was measured, measured value like the publication to the 1st following table was obtained. Moreover, a frequency which is different about the produced electrolytic capacitor in the impedance ratio (Z ratio) expressed as a ratio with that of each measured value after measuring the impedance in low temperature (-40 degrees C), and the impedance in ordinary temperature (20 degrees C): It measured by 120Hz and 100kHz. Measured value like the publication to the 1st following table was obtained. Furthermore, in order to evaluate the life property of each electrolytic capacitor, initial value (characteristic value immediately after production of a capacitor) and the characteristic value after elevated-temperature neglect (1000 hours pass at 105 degrees C) were measured about each of capacity, tandelta, and the leakage current. Measured value like the publication to the 1st following table was obtained.

examples 2-10 -- although the technique of a publication was repeated in said example 1, in this example, the presentation of the electrolytic solution to be used was changed into the 1st following table like a publication. The result obtained by the characteristic test is collectively indicated to the 1st following table.

the examples 1-4 of a comparison -- although the technique of a publication was repeated in said example 1, while removing the nitro compound from the electrolytic solution to be used for the comparison in this example, the presentation of the electrolytic solution was changed into the 1st following table like a publication. The result obtained by the characteristic test is collectively indicated to the 1st following table.

[0043]

[Table 1]

第1表

例の番号	電解液の組成（重量%）	比抵抗30℃ (Ω・cm)	Z比		初期値			105℃ 3000時間後		
			120Hz [-40／20℃]	100kHz [-40／20℃]	容量 [μF]	tanδ (%)	漏れ電流 [μA]	容量 [μF]	tanδ (%)	漏れ電流 [μA]
実施例1	エチレングリコール 25.0 水 68.0 ギ酸アンモニウム 4.6 次亜リン酸 0.4 n－ニトロアセトフェノン 1.0 ニトロ安息香酸 1.0	28	1.1	4.6	1044	5.4	7.7	898	6.2	2.3
実施例2	エチレングリコール 20.0 水 60.0 グルタル酸アンモニウム 16.4 スルファミン酸 1.6 ニトロフェノール 1.0 n－ニトロアセトフェノン 1.0	26	1.1	4.4	1034	5.4	7.2	900	6.2	2.3
実施例3	エチレングリコール 15.0 水 60.0 アジピン酸アンモニウム 23.0 ニトロ安息香酸 1.0 ニトロフェノール 1.0	23	1.1	3.9	1025	5.3	7.0	902	6.1	2.0
実施例4	エチレングリコール 22.0 水 50.0 コハク酸アンモニウム 25.0 ベンゼンスルホン酸 0.4 ニトロフェノール 2.6	21	1.1	3.8	1020	5.2	6.8	918	6.0	2.0
実施例5	エチレングリコール 48.0 水 40.0 ホウ酸アンモニウム 11.0 ニトロ安息香酸 1.0	161	1.2	5.6	1024	8.7	6.2	932	9.5	1.9
実施例6	エチレングリコール 54.0 水 30.0 スルファミン酸アンモニウム 14.6 リン酸 0.4 n－ニトロアセトフェノン 1.0	29	1.0	3.7	1010	5.4	6.1	929	6.2	2.0
実施例7	エチレングリコール 60.0 水 20.0 アジピン酸アンモニウム 18.6 ホウ酸 0.4 ニトロ安息香酸 1.0	58	1.0	3.6	1003	6.2	6.3	933	7.0	2.1
実施例8	エチレングリコール 62.0 水 27.0 アジピン酸アンモニウム 9.0 n－ニトロアセトフェノン 1.0 ニトロフェノール 1.0	94	1.0	3.8	1005	7.1	6.2	940	7.9	2.1
実施例9	エチレングリコール 40.0 水 40.0 グルタル酸アンモニウム 19.0 ニトロ安息香酸 1.0	40	1.0	3.6	1018	5.8	6.4	937	6.4	2.2
実施例10	エチレングリコール 50.0 水 39.4 アジピン酸アンモニウム 9.2 スルファミン酸 0.4 ニトロフェノール 1.0	68	1.0	3.7	1013	6.4	6.4	942	7.0	2.3

[0044]
[Table 2]

表1 表(続き)

例の番号	電解液の組成（重量%）		比抵抗30℃ (Ω・cm)	Z比		初期値			105℃ 3000時間後			
				120Hz [-40℃/20℃]	100kHz [-40℃/20℃]	容量 (μF)	tanδ (%)	漏れ電流 (μA)	容量 (μF)	tanδ (%)	漏れ電流 (μA)	外観
比較例1	エチレングリコール	60.0	85	1.3	36.1	1000	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
	水	30.0										
	アジピン酸アンモニウム	10.0										
比較例2	エチレングリコール	45.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
	水	40.0										
	アジピン酸アンモニウム	15.0										
比較例3	エチレングリコール	30.0	20	1.0	7.8	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
	水	50.0										
	アジピン酸アンモニウム	20.0										
比較例4	エチレングリコール	29.0	20	1.0	7.9	1022	4.8	7.0	ガス発生により1000時間までに全数防爆弁作動			
	水	50.0										
	アジピン酸アンモニウム	20.0										
	ニトロ安息香酸	1.0										

[0045] Except for an example 5, it turns out that the specific resistance of the electrolytic solution of this invention is almost equivalent to the thing of the example of a comparison, and it turns out that such resistivity is small compared with it of the conventional common electrolytic solution so that I may be understood from a result given in the 1st above-mentioned table. It can be said that it is substantially [as the usual electrolytic capacitor] equal, and is in sufficiently practical level when it judges synthetically in consideration of other properties although the specific resistance of the electrolytic solution of an example 5 is the big value of 161 ohm-cm. Therefore, the electrolytic capacitor produced using the electrolytic solution of this invention can realize much more low impedance compared with the conventional electrolytic capacitor, and even if it is not so, it can realize an old thing and low impedance of equivalent extent at least.

[0046] Moreover, if it is in the electrolytic capacitor which used the electrolytic solution of this invention, it turns out that Z ratio is small, and it turns out that Z ratio in the high frequency which is especially 100kHz is small stopped

compared with the thing of the example of a comparison. This shows that the electrolytic capacitor which used the electrolytic solution of this invention demonstrates a low-temperature property with a good rear spring supporter in a large frequency. Especially in the electrolytic capacitor which used the electrolytic solution of this invention, by having added the nitro compound to the electrolytic solution in the amount of 0.01 - 3% of the weight of the range, the property stabilized after 3000-hour progress at 105 degrees C is shown, and it did not result in destruction of the capacitor by the generation of gas itself. To it, in the phase in early stages of the elevated-temperature neglect before [far] 3000 hours pass, the explosion-proof valve operated with the swelling of the case by the hydrogen generation of gas, and it became use impossible by any capacitor with the electrolytic capacitor of the example of a comparison which used the electrolytic solution which does not contain a nitro compound. According to this invention, this shows that the reinforcement of an electrolytic capacitor can attain easily.

examples 11-19 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of a chelate compound and a nitro compound in this example, the presentation of the electrolytic solution to be used was changed into the 2nd following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 2nd following table. In addition, in the 2nd following table, the test result of said examples 1-3 of a comparison is also united and indicated.

[0047]

[Table 3]

[0048]
[Table 4]

第2表

例の番号	電解液の組成〔重量%〕		比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 1000時間後			
				120Hz〔-40／20℃〕	100kHz〔-40／20℃〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	外観
比較例1	エチレングリコール 水 アジピン酸アンモニウム	60.0 30.0 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 水 アジピン酸アンモニウム	45.0 40.0 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 水 アジピン酸アンモニウム	30.0 50.0 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
実施例11	エチレングリコール 水 ギ酸アンモニウム 次亜リン酸 p-ニトロ安息香酸 エチレンジアミン四酢酸	25.0 69.4 4.0 0.4 0.8 0.4	21	1.1	4.6	1044	5.2	7.8	919	5.8	2.5	
実施例12	エチレングリコール 水 グルタル酸アンモニウム スルファミン酸 ニトロフェノール エチレンジアミン四酢酸	20.0 59.2 17.8 1.6 1.0 0.4	26	1.1	4.4	1036	5.4	7.3	922	6.0	2.3	
実施例13	エチレングリコール 水 アジピン酸アンモニウム ジニトロ安息香酸 エチレンジアミン二酢酸	15.0 58.7 24.4 1.5 0.4	23	1.1	3.9	1028	5.3	7.1	925	5.9	2.2	
実施例14	エチレングリコール 水 コハク酸アンモニウム ベンゼンスルホン酸 p-ニトロ安息香酸 ジエチレントリアミン五酢酸	24.2 50.0 24.2 0.4 0.8 0.4	21	1.1	3.8	1021	5.2	6.9	930	5.8	2.2	

第2表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃ [Ω・cm]	Z比		初期値			105℃ 1000時間後			
				120Hz/20℃ [-40/20℃]	100kHz/20℃ [-40/20℃]	容量 [μF]	tanδ [%]	漏れ電流 [μA]	容量 [μF]	tanδ [%]	漏れ電流 [μA]	外観
実施例15	エチレングリコール 水 スルファミン酸アンモニウム リン酸フェノール ニトロフェノール エチレンジアミン四酢酸	55.0 28.0 14.0 2.0 0.6 0.4	29	1.0	3.7	1009	5.4	6.2	938	6.0	2.2	
実施例16	エチレングリコール 水 アジピン酸アンモニウム ホウ酸 ニトロフェノール エチレンジアミン二酢酸	59.2 20.0 19.0 0.4 1.0 0.4	57	1.0	3.6	1002	6.1	6.4	944	6.7	2.4	
実施例17	エチレングリコール 水 アジピン酸アンモニウム EDTPO ニトロ安息香酸 エチレンジアミン四酢酸	62.0 27.0 9.3 0.1 1.2 0.4	92	1.0	3.8	1003	7.0	6.5	942	7.6	2.4	
実施例18	エチレングリコール 水 グルタル酸アンモニウム ニトロフェノール EDTPO	38.8 40.0 19.6 1.2 0.4	39	1.0	3.6	1018	5.8	6.3	937	6.4	2.1	
実施例19	エチレングリコール 水 アジピン酸アンモニウム スルファミン酸 ニトロフェノール エチレンジアミン二酢酸	48.8 40.0 9.2 0.4 1.2 0.4	68	1.0	3.7	1014	6.4	6.2	943	7.0	2.2	

[0049] examples 20-29 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of a saccharide and a nitro compound in this example, the presentation of the electrolytic solution to be used was changed into the 3rd following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 3rd following table. In addition, in the 3rd following table, the test result of said examples 1-3 of a comparison is also united and indicated.

[0050]

[Table 5]

第3表

例の番号	電解液の組成〔重量%〕	比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 1000時間後			
			120Hz〔-40／20℃〕	100kHz〔-40／20℃〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	外観
比較例1	エチレングリコール 60.0 水 30.0 アジピン酸アンモニウム 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 45.0 水 40.0 アジピン酸アンモニウム 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 30.0 水 50.0 アジピン酸アンモニウム 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
実施例20	エチレングリコール 23.2 水 70.0 ギ酸アンモニウム 4.4 ガラクトース 1.0 ニトロフェノール 1.0 次亜リン酸 0.4	22	1.1	4.6	1043	5.3	7.7	918	5.9	2.5	
実施例21	エチレングリコール 19.4 水 60.0 グルタル酸アンモニウム 17.8 フルクトース 1.0 ニトロ安息香酸 0.8 スルファミン酸 1.0	27	1.1	4.4	1035	5.4	7.2	921	6.0	2.3	
実施例22	エチレングリコール 14.2 水 60.0 アジピン酸アンモニウム 23.8 ジニトロ安息香酸 1.0 キシロース 1.0	24	1.1	3.9	1027	5.3	7.0	924	5.9	2.2	
実施例23	エチレングリコール 20.8 水 50.0 コハク酸アンモニウム 24.8 グルコース 1.0 ニトロフェノール 3.0 ベンゼンスルホン酸 0.4	22	1.1	3.8	1020	5.3	6.8	930	5.9	2.2	
実施例24	エチレングリコール 48.7 水 39.8 ホウ酸アンモニウム 9.0 ニトロフェノール 1.5 キシロース 1.0	162	1.2	5.6	1014	8.8	6.2	933	9.4	2.1	

[0051]
[Table 6]

第3表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃ (Ω・cm)	Z比		初期値			105℃ 1000時間後			
				120Hz (-40/20℃)	100kHz (-40/20℃)	容量 (μF)	tanδ (%)	漏れ電流 (μA)	容量 (μF)	tanδ (%)	漏れ電流 (μA)	外観
実施例25	エチレングリコール	53.2	30	1.0	3.7	1008	5.5	6.1	937	6.1	2.2	
	水	30.0										
	スルファミン酸アンモニウム	13.8										
	フルクトース	1.9										
	ニトロ安息香酸	1.5										
	リン酸	0.5										
実施例26	エチレングリコール	59.2	59	1.0	3.6	1001	6.2	6.3	944	6.8	2.4	
	水	20.0										
	アジピン酸アンモニウム	17.8										
	グルコース	1.0										
	ニトロ安息香酸	1.0										
	ホウ酸	1.0										
実施例27	エチレングリコール	60.9	91	1.0	3.8	1002	7.0	6.2	944	7.6	2.4	
	水	28.9										
	アジピン酸アンモニウム	8.3										
	ニトロ安息香酸	0.8										
	フルクトース	1.0										
実施例28	エチレングリコール	38.2	40	1.0	3.6	1018	5.8	6.3	937	6.4	2.1	
	水	40.6										
	グルタル酸アンモニウム	18.8										
	ニトロアセトアニリン	2.0										
	ガラクトース	1.0										
実施例29	エチレングリコール	47.7	69	1.0	3.7	1013	6.4	6.2	942	7.0	2.2	
	水	39.4										
	アジピン酸アンモニウム	9.0										
	スルファミン酸	0.4										
	ニトロ安息香酸	2.0										
	キシロース	1.0										

[0052] examples 30-39 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of hydroxybenzyl alcohol, glutamic-acid 2 acetic acid, etc. and a nitro compound in this example, the presentation of the electrolytic solution to be used was changed into the 4th following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 4th following table. In addition, in the 4th following table, the test result of said examples 1-3 of a comparison is also united and indicated.

[0053]

[Table 7]

[0054]
[Table 8]

第4表

例の番号	電解液の組成〔重量%〕	比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 1000時間後			
			120Hz〔-40／20℃〕	100kHz〔-40／20℃〕	容量〔μF〕	tanδ(%)	漏れ電流〔μA〕	容量〔μF〕	tanδ(%)	漏れ電流〔μA〕	外観
比較例1	エチレングリコール 60.0 水 30.0 アジピン酸アンモニウム 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 45.0 水 40.0 アジピン酸アンモニウム 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 30.0 水 50.0 アジピン酸アンモニウム 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
実施例30	エチレングリコール 24.0 水 68.0 ギ酸アンモニウム 4.4 次亜リン酸 0.4 ジニトロ安息香酸 1.2 ヒドロキシベンジルアルコール 2.0	21	1.1	4.6	1044	5.2	7.7	919	5.8	2.5	
実施例31	エチレングリコール 17.7 水 60.0 グルタル酸アンモニウム 16.8 スルファミン酸 1.6 ニトロフェノール 2.5 グルタミン酸二酢酸 1.4	27	1.1	4.4	1034	5.4	7.2	920	6.0	2.3	
実施例32	エチレングリコール 14.2 水 60.0 アジピン酸アンモニウム 23.4 ニトロ安息香酸 1.0 グルタミン酸二酢酸 1.4	24	1.1	3.9	1025	5.3	7.0	923	5.9	2.2	
実施例33	エチレングリコール 20.8 水 50.0 コハク酸アンモニウム 24.8 ベンゼンスルホン酸 0.4 ニトロ安息香酸 2.0 ヒドロキシベンジルアルコール 2.0	22	1.1	3.8	1020	5.3	6.8	930	5.9	2.2	
実施例34	エチレングリコール 44.7 水 40.0 ホウ酸アンモニウム 9.8 ジニトロ安息香酸 1.5 ヒドロキシベンジルアルコール 4.0	161	1.2	5.6	1024	8.7	6.2	942	9.3	2.1	

第4表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃（Ω・cm）	Z比		初期値			105℃ 1000時間後			
				120Hz [-40/20℃]	100kHz [-40/20℃]	容量（μF）	tanδ（%）	漏れ電流（μA）	容量（μF）	tanδ（%）	漏れ電流（μA）	外観
実施例35	エチレングリコール	52.2	30	1.0	3.7	1010	5.5	6.1	939	6.1	2.2	
	ホスフィン酸アンモニウム	30.0										
	リン酸ファミン酸アンモニウム	13.8										
	ニトロアセトフェノン	0.4										
	グルタミン酸二酢酸	1.0										
		2.6										
実施例36	エチレングリコール	57.2	63	1.0	3.6	1003	6.3	6.3	944	6.9	2.4	
	ホスフィン酸アンモニウム	20.0										
	ニトロフェノールアルコール	15.0										
	ヒドロキシベンジルアルコール	3.0										
	グルタミン酸二酢酸	2.6										
		2.2										
実施例37	エチレングリコール	59.2	95	1.0	3.8	1005	7.1	6.2	944	7.7	2.4	
	ホスフィン酸アンモニウム	27.0										
	ニトロ安息香酸二ウム	9.3										
	グルタル酸アンモニウム	1.5										
	グルタミン酸二酢酸	1.5										
		1.5										
実施例38	エチレングリコール	39.6	39	1.0	3.6	1018	5.8	6.3	937	6.4	2.1	
	ホスタル酸アンモニウム	40.0										
	ニトロフェノールアルコール	19.0										
		0.4										
		1.0										
実施例39	エチレングリコール	48.7	68	1.0	3.7	1013	6.4	6.4	942	7.0	2.3	
	ホスフィン酸アンモニウム	39.4										
	スルファミン酸アンモニウム	9.0										
	ニトロ安息香酸	0.4										
	ヒドロキシベンジルアルコール	1.5										

[0055] examples 40-49 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness of the simultaneous adding of a nitro compound and glucono lactone in this example, the presentation of the electrolytic solution to be used was changed into the 5th following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 5th following table. In addition, in the 5th following table, the test result of said examples 1-4 of a comparison is also united and indicated.

[0056]

[Table 9]

[0057]
[Table 10]

第5表

例の番号	電解液の組成〔重量%〕		比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 3000時間後			
				120Hz [-40／20℃]	100kHz [-40／20℃]	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	外観
比較例1	エチレングリコール 水 アジピン酸アンモニウム	60.0 30.0 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 水 アジピン酸アンモニウム	45.0 40.0 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 水 アジピン酸アンモニウム	30.0 50.0 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
比較例4	エチレングリコール 水 アジピン酸アンモニウム ニトロ安息香酸	29.0 50.0 20.0 1.0	20	1.0	7.9	1022	4.8	7.0	ガス発生により1000時間までに全数防爆弁作動			
実施例40	エチレングリコール 水 ギ酸アンモニウム 次亜リン酸 グルコノラクトン p－ニトロアセトフェノン ニトロ安息香酸	25.0 68.0 4.4 0.4 0.2 1.0 1.0	28	1.1	4.6	1044	5.6	7.7	898	6.4	2.3	
実施例41	エチレングリコール 水 グルタル酸アンモニウム スルファミン酸 グルコノラクトン ニトロフェノール p－ニトロアセトフェノン	20.0 60.0 16.2 1.6 0.2 1.0 1.0	26	1.1	4.4	1034	5.5	7.2	900	6.3	2.3	
実施例42	エチレングリコール 水 アジピン酸アンモニウム グルコノラクトン ニトロ安息香酸 ニトロフェノール	15.0 60.0 22.8 0.2 1.0 1.0	23	1.1	3.9	1025	5.4	7.0	902	6.2	2.0	
実施例43	エチレングリコール 水 コハク酸アンモニウム ベンゼンスルホン酸 グルコノラクトン ニトロフェノール	22.0 50.0 25.0 0.4 0.2 2.6	21	1.1	3.8	1020	5.2	6.8	918	6.0	2.0	

第5表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃（Ω・cm）	Z比		初期値			105℃ 3000時間後			
				120Hz (-40/20℃)	100kHz (-40/20℃)	容量（μF）	tanδ（%）	漏れ電流（μA）	容量（μF）	tanδ（%）	漏れ電流（μA）	外観
実施例44	エチレングリコール	48.0	161	1.2	5.6	1024	8.8	6.2	932	9.6	1.9	
	ホウ酸アンモニウム	40.0										
	グルコノラクトン	10.8										
	ニトロ安息香酸	1.0										
実施例45	エチレングリコール	54.0	29	1.0	3.7	1010	5.6	6.1	929	6.4	2.0	
	ホスホノブタン1,2,4-トリカルボン酸アンモニウム	30.0										
	リン酸ラクトン	14.4										
	グルコノラクトン	0.4										
	ニトロアセトフェノン	1.0										
実施例46	エチレングリコール	60.0	58	1.0	3.6	1003	6.2	6.3	933	7.0	2.1	
	アジピン酸アンモニウム	20.0										
	ホウ酸グルコノラクトン	16.4										
	ニトロ安息香酸	0.4										
		1.6										
実施例47	エチレングリコール	62.0	95	1.0	3.8	1005	6.9	6.2	940	7.7	2.1	
	アジピン酸アンモニウム	27.0										
	グルコノラクトン	6.8										
	ニトロアセトフェノン	1.0										
	ニトロフェノール	1.0										
実施例48	エチレングリコール	40.0	40	1.0	3.6	1018	5.8	6.4	937	6.4	2.2	
	グルタル酸アンモニウム	18.8										
	グルコノラクトン	0.2										
	ニトロ安息香酸	1.0										
実施例49	エチレングリコール	50.0	68	1.0	3.7	1013	6.5	6.4	942	7.1	2.3	
	アジピン酸アンモニウム	39.4										
	スルファミン酸	9.4										
	グルコノラクトン	0.2										
	ニトロフェノール	1.0										

[0058] examples 50-59 -- although the technique of a publication was repeated in said example 1, in order to check the effectiveness brought about with the combination of the arbitration of various kinds of additives in this example, the presentation of the electrolytic solution to be used was changed into the 6th following table like a publication. The test result which may be satisfied was able to be obtained so that it might indicate collectively to the 6th following table. In addition, in the 6th following table, the test result of said examples 1-4 of a comparison is also united and indicated.

[0059]

[Table 11]

[0060]
[Table 12]

第6表

例の番号	電解液の組成〔重量%〕		比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 3000時間後			
				120Hz〔-40／20℃〕	100kHz〔-40／20℃〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	外観
比較例1	エチレングリコール 水 アジピン酸アンモニウム	60.0 30.0 10.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
比較例2	エチレングリコール 水 アジピン酸アンモニウム	45.0 40.0 15.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
比較例3	エチレングリコール 水 アジピン酸アンモニウム	30.0 50.0 20.0	20	1.0	7.9	1023	4.7	6.9	ガス発生により250時間までに全数防爆弁作動			
比較例4	エチレングリコール 水 アジピン酸アンモニウム ニトロ安息香酸	29.0 50.0 20.0 1.0	20	1.0	7.9	1022	4.8	7.0	ガス発生により1000時間までに全数防爆弁作動			
実施例50	エチレングリコール 水 リン酸アンモニウム 次亜リン酸 エチレンジアミン四酢酸 グルタミン酸二酢酸 グルコノラクトン p-ニトロアセトフェノン ニトロ安息香酸	24.0 68.0 4.4 0.4 0.5 0.2 0.2 1.0 1.0	28	1.1	4.6	1044	5.3	7.7	898	6.1	2.3	
実施例51	エチレングリコール 水 グルタル酸アンモニウム スルファミン酸 ジエチレントリアミン五酢酸 フルクトース グルコノラクトン ニトロフェノール p-ニトロアセトフェノン	18.0 60.0 16.2 1.6 1.0 1.0 0.2 1.0 1.0	26	1.1	4.4	1034	5.2	7.2	900	6.0	2.3	
実施例52	エチレングリコール 水 アジピン酸アンモニウム エチレンジアミン四酢酸 ヒドロキシベンジルアルコール グルコノラクトン ニトロ安息香酸 ニトロフェノール	15.0 57.0 22.8 2.0 0.5 0.2 1.0 1.0	23	1.1	3.9	1025	5.5	7.0	902	6.3	2.0	

第６表（続き）

例の番号	電解液の組成〔重量%〕	比抵抗30℃〔Ω・cm〕	Z比		初期値			105℃ 3000時間後			
			120Hz〔-40／20℃〕	100kHz〔-40／20℃〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	容量〔μF〕	tanδ〔%〕	漏れ電流〔μA〕	外観
実施例53	エチレングリコール 20.6 水 50.0 コハク酸アンモニウム 25.0 エチレンジアミン二酢酸 1.0 グルタミン酸二酢酸 0.2 ベンゼンスルホン酸 0.4 グルコノラクトン 0.2 ニトロフェノール 2.6	21	1.1	3.8	1020	5.4	6.8	918	6.2	2.0	
実施例54	エチレングリコール 46.7 水 40.0 ホウ酸アンモニウム 10.8 エチレンジアミン二酢酸 0.8 ヒドロキシベンジルアルコール 0.5 グルコノラクトン 0.2 ニトロ安息香酸 1.0	161	1.2	5.6	1024	8.9	6.2	932	9.7	1.9	
実施例55	エチレングリコール 52.0 水 30.0 スルファミン酸アンモニウム 14.4 キシロース 0.5 EDTPO 1.0 グルタミン酸二酢酸 0.5 リン酸 0.4 グルコノラクトン 0.2 n－ニトロアセトフェノン 1.0	29	1.0	3.7	1010	5.2	6.1	929	6.0	2.0	
実施例56	エチレングリコール 57.5 水 20.0 アジピン酸アンモニウム 18.4 エチレンジアミン四酢酸 1.5 ヒドロキシベンジルアルコール 0.5 グルタミン酸二酢酸 0.5 ホウ酸 0.4 グルコノラクトン 0.2 ニトロ安息香酸 1.0	58	1.0	3.6	1003	6.1	6.3	933	6.9	2.1	

[0061]
[Table 13]

第6表（続き）

例の番号	電解液の組成（重量%）		比抵抗30℃（Ω・cm）	Z比		初期値				105℃ 3000時間後			
				120Hz/20℃	100kHz/20℃	容量（μF）	tanδ（%）	漏れ電流（μA）		容量（μF）	tanδ（%）	漏れ電流（μA）	外観
実施例57	エチレングリコール	57.5	85	1.0	3.8	1005	6.0	6.2		940	7.6	2.1	
	ホウ酸アンモニウム	27.0											
	ジエチレントリアミン五酢酸	8.8											
	グルコースペンタアセトヒドロキシラクトフェノン	3.0											
	ニトロフェノール	6.5											
		2.0											
		1.0											
実施例58	エチレングリコール	37.9	40	1.0	3.6	1018	4.8	6.4		937	5.4	2.2	
	ホウ酸アンモニウム	40.0											
	マレイン酸二酢酸アンモン	1.5											
	グルタル酸アンモン	0.6											
	ニトロフェノール	18.8											
	安息香酸	0.2											
		1.0											
実施例59	エチレングリコール	47.5	68	1.0	3.7	1013	6.8	6.4		942	7.4	2.3	
	ホウ酸アンモニウム	39.4											
	アゼライン酸アンモン	3.0											
	EDTPO	1.0											
	フルクトース	6.5											
	フルフラミン酸	0.4											
	ニトロフェノール	0.2											
		1.0											

[0062] the examples 5-8 of a comparison, and examples 60-62 -- although the technique of a publication was repeated in said example 1, in order to check the further improvement in a life property in this example, measurement of the specific value in the elevated-temperature neglect conditions (1000 hours pass at 105 degrees C) of adoption was changed and carried out after 6000-hour progress by 105 degrees C in the example 1. A result like the publication to the 7th following table was obtained.

[0063]

[Table 14]

第7表

例の番号	電解液の組成〔重量%〕		比抵抗:30℃ (Ω・cm)	Z比		初期値			105℃ 6000時間後			
				120Hz [-40/20℃]	100kHz [-40/20℃]	容量 (μF)	tanδ (%)	漏れ電流 (μA)	容量 (μF)	tanδ (%)	漏れ電流 (μA)	外観
比較例5	エチレングリコール	60.0	85	1.3	36.1	1008	7.0	6.5	ガス発生により500時間までに全数防爆弁作動			
	水	30.0										
	アジピン酸アンモニウム	10.0										
比較例6	エチレングリコール	45.0	40	1.1	9.7	1014	5.7	6.1	ガス発生により250時間までに全数防爆弁作動			
	水	40.0										
	アジピン酸アンモニウム	15.0										
比較例7	エチレングリコール	30.0	20	1.0	7.9	1023	4.7	6.0	ガス発生により250時間までに全数防爆弁作動			
	水	50.0										
	アジピン酸アンモニウム	20.0										
比較例8	エチレングリコール	29.0	20	1.0	7.9	1022	4.8	7.0	ガス発生により1000時間までに全数防爆弁作動			
	水	50.0										
	アジピン酸アンモニウム	20.0										
	ニトロ安息香酸	1.0										
実施例60	エチレングリコール	25.0	28	1.1	4.6	1044	5.4	7.7	855	6.6	2.1	
	水	68.6										
	半酸アンモニウム	4.6										
	次亜リン酸	0.4										
	ローニトロアセトフェノン	1.0										
	ニトロ安息香酸	1.0										
実施例61	エチレングリコール	15.0	23	1.1	3.9	1025	5.3	7.0	668	8.2	1.6	
	水	60.0										
	アジピン酸アンモニウム	23.0										
	ニトロ安息香酸	1.0										
	ニトロフェノール	1.0										
実施例62	エチレングリコール	40.0	40	1.0	3.6	1018	5.8	6.4	632	9.1	1.1	
	水	40.0										
	グルタル酸アンモニウム	19.0										
	ニトロ安息香酸	1.0										

[0064] In the 7th table of the above, the examples 5-8 of a comparison are equivalent to said examples 1-4 of a comparison, respectively, and examples 60-62 are equivalent to said examples 1, 3, and 9, respectively. Although the fall of capacity was accepted to each having become use impossible by the time 250 to 500 hours passed in the comparisons 5-7 which used the electrolytic solution which does not add a nitro compound so that I might be understood from the result of a publication in the case of the capacitor of examples 60-62, it was usable also after 6000-hour progress. Moreover, by having used together the carboxylic acid of an organic system electrolyte, or the salt and the inorganic acid of an inorganic system electrolyte to what should be observed shows that the life property of an electrolytic capacitor is improved further.

[0065]

[Effect of the Invention] It excels in the low-temperature property which according to this invention is low impedance and is expressed with the impedance ratio in low temperature and ordinary temperature as explained above, and a life

property is good and the electrolytic solution for a drive for electrolytic capacitors which can do so the hydrogen gas absorption effectiveness of having excelled even when an electrolytic capacitor was used under the time of using the electrolytic solution which moreover used the solvent with the large content rate of water, or hot environments is offered. Moreover, according to this invention, by using such the electrolytic solution, it excels in a low-temperature property, and a life property is good and the electrolytic capacitor of the high-reliability which does not have the fault which results from an operation of the water used in a solvent, and is generated, especially an aluminium electrolytic capacitor are offered by low impedance.

[Translation done.]